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Steel Castings as Ship Stabilizers

The Largest Gyroscopic Rotors Made Now
Being Installed in a U. S. Army Transport—
Their Application to Submarines and Aeroplanes

STEEL castings are being introduced into a new field. One of the latest developments in naval construction is the gyroscopic stabilizer for large and small ships and the steel casting is the leading feature in their construction.

The accompanying illustration shows the largest casting for this new purpose ever made. As a result of extensive investigations and experiments by the United States Government, two of these stabilizers are being installed on United States Navy transport No. 1, now nearing completion at the Philadelphia Navy Yard. They are the outgrowth of successful attempts to apply this principle and apparatus to the United States destroyer Worden.

The first attempts at stabilizing ships were made by Sir Phillip Watts who in the eighteen - eighties placed damping tanks on English battleships of the Invincible class. Later Sir John I. Thornycroft, an Englishman, employed a large weight as a stabilizer, equal to about 5 per cent of the ship's displacement. Quite recently Herr Frahm again invented damping tanks, partly filled with water and made in the shape of horseshoes, which he placed on several large ships. Dr. Schlick, a German engineer, first employed a gyroscope as a stabilizer for ships. It was a large wheel, mounted horizontally in the ship, and so located as to swing freely with its shaft vertical, constituting a passive type of gyroscope.

The weak point in most of these ideas was ineffectiveness in damping the ship's roll until a motion of considerable magnitude had set in. An American engineer, Elmer A. Sperry, has lately perfected a gyroscopic stabilizer, known as the active type, which, it is claimed, actually prevents a ship from rolling under any conditions. It is for this new type of stabilizer that these large castings

and smaller ones have been made successfully by the Penn Works at Chester, Pa., of the Penn Marine & Ordnance Castings Company.

While the design of the casting itself does not present any unusual problems in steel foundry practice, it is not one that can be easily made acceptable in every respect. Subjected as it is to an unusually severe inspection before its final acceptance, great care is necessary in making the mold, in its drying, in its heading and gating, and in the soundness of the metal. The casting as shown weighs about 56,000 lb. as it leaves the foundry. It

is 10 ft. in diameter and 27 in. thick on its face. Revolving as it must at a very high rate of speed—1150 r.p.m.—to perform its function, uniformity of section and absolute soundness are very important essentials. To insure this the heading of such a casting must be ampler than is normally the practice for a casting of this design. In this case five large heads were put on the outside rim so that the actual metal necessary to pour it was nearly 110,000 lb. It was cast with the broad side down. Another consideration requiring soundness is the fact that the castings are machined practically all over, and any blowholes, defects or shrinkage cavities would militate against

their acceptance. They must be nearly perfect.

The metal is plain carbon, open-hearth steel but made from carefully selected stock and under conditions insuring the best steel possible by this process. The average composition of castings for this purpose is 0.25 to 0.30 per cent carbon, 0.60 to 0.70 per cent manganese, 0.25 to 0.30 per cent silicon, and a phosphorus and sulphur content of about 0.040 per cent. No alloys have been considered necessary either for purifying purposes or as a constituent of the metal.

The removal of all interior strains and initial



The Largest Rotor Casting Ever Made. It weighs 56,000 lb. and two are being installed on U. S. Transport No. 1, as part of a Sperry Gyroscopic Stabilizer

stresses in the metal is even more essential in such a casting than in many others, and therefore a most careful and thorough annealing is resorted to—a heat treatment that insures a complete heat permeation of every part of the casting and a thorough rearrangement and adjustment of the crystals and the neutralization of all ingotism. This is not easy unless unusual care is practised in the annealing process. The casting being subjected to severe strains in its rapid revolutions, there must be no possibility of cleavage between groups of large and small crystals.

Besides the castings here described, others have been made of smaller dimensions and applied to smaller ships. In addition to those installed on the United States destroyer Worden, a successful commercial installation is that on the small yacht

Widgeon, plying on the Great Lakes and owned by M. A. Hanna, Jr., of Cleveland, Ohio. In this case the weight of the gyro-rotor or casting, the shaft and armature is 2150 lb. and its revolutions per minute are 2750. The rotor itself is 3 ft. in diameter and has a 10-in. face. The total weight of the equipment is about 1 per cent of the displacement of the yacht.

The smallest gyro-rotor in service is one on a speed motor boat. It makes 5000 r.p.m., is 24.5 in. in diameter and weighs 550 lb. The boat has a speed of 37 miles per hour. Proper steel for such a casting is even more difficult to make than for the very large rotor.

Submarines are also being stabilized by means of such castings and the principle is also being applied to aeroplanes. The field apparently is large.

Keeping Records of Finished Products*

Accurate Records of Completed Machines Are Necessary for Estimating Future Sales and for Furnishing Repair Parts for Customer's Equipment

BY H. A. RUSSELL

WHEN the production department receives its copy of the estimated sales and has issued the necessary manufacturing orders, the permanent production record sheet (Fig. 1) is filled in. The catalog number and description of the machine are written in the space at the top, together with the figures which indicate the year or season for which the machines are built, and the word Regular or Catalog. At times a special lot of machines may be built for a customer, in which event the word Special would be written instead. It even

may be advisable to furnish a more complete description of the machine for future reference.

In the left-hand column is entered the quantity of machines specified on the estimated sales and the office order number. In the next column will appear two dates. The first is the date of the order and the second the approximate date on which the machines should be finished. The second date really indicates the beginning of the season for that particular machine. A copy of each customer's order is sent to the production department and entered in the third, fourth, fifth and sixth columns. As each machine is finished it is reported in writing to the production department by the foreman of the fin-

*The third and final article of a series on regulating and balancing production in a large agricultural implement factory. The previous articles appeared in THE IRON AGE of June 29 and July 6.

Form 7-P-1020-11-10-12.

MACHINE NAME #25 THRESHING MACHINE				FIG. No. 1915 - REGULAR					
STOCK ORDER No.	DATE ISSUED	No.	OFFICE ORDER No.	CUSTOMER	DATE PROMISED	DATE TAKEN AND PROMISED	DATE SHIPPED	SHOP NUMBER	REMARKS
50 95409	12-1 1914	1	96627	JOHN SMITH	6-6	6-5	6-6	7421	
		1	96629	A. S. CLARK	6-10	6-5	6-9	7422	
	6-1 1915	1	96643	JONES AND JONES	6-10	6-5	6-10	7423	
		1	"	" " "	"	"	"	7424	
	1	"	" " "	"	"	"	7425		
	1	96685	BROWN & CO	6-5	"	6-6	7420		
	1	97207	SANSOM & ANDREWS	6-12	6-8	6-12	7426		
							7427		
							7428		
							7429		

Fig. 1—The permanent production record sheet tells how many uncompleted machines are in process, when they will be finished and who purchased the completed ones. The customer's name and promise date are entered as soon as the order is received and the other entries are made as the work progresses. The sheet is a loose leaf sheet, ruled on both sides and is 10 x 13 in.

Comparative Monthly Inventory and Record of Machines Built													
1916. <i>Threshing Machines</i> Class No. 7													
	Jan. 1st	Feb. 1st	Mch. 1st	Apr. 1st	May 1st	June 1st	July 1st	Aug. 1st	Sept. 1st	Oct. 1st	Nov. 1st	Dec. 1st	
#21 Machine	2	12	12	22									On Hand
	400	2400	2400	4400									INV. Value 200
	10	0	10	0									Built During Mo.
#22 "	0	0	0	10									2250
				250									
				10									
#23 "	1	1	0	10									250
	250	250		2500									
	0	0	0	10									
#24 "	5	5	15	12									250
	1400	1400	4200	3360									
	0	10	0	10									
#25 "	8	8	8	15									210
	2480	2480	2480	5580									
	0	0	10	10									
#26 "	0	0	0	10									1700
				1700									
				10									
													Total on Hand
													" Value
													" Built

Fig. 2—The monthly inventory shows the quantity and value of finished machines on hand and compares them with the figures of corresponding months in other years

ishing department, who gives a description and the shop number of the machine. The shop number is stamped on the brass name plate which is securely attached to the machine. The entries are then made in the proper columns and on the correct line, that is, the machines as finished are recorded by number on the same line as the customer's name and according to the shipping date that has been promised.

The production order for parts calls for fifty sets but the first erecting order calls for only ten machines. As soon as these ten are finished another erecting order is issued, providing it was not deemed more expedient to erect a group of another size or style of machine. The production department has a complete grasp on the situation because each customer's order is recorded as received and if there is a run on any particular size or style machine, it is notified automatically through the recording of the orders. Fig. 1 shows that there were three more machines finished than the num-

ber of orders received, at the time of the last entry. The record is accurate at all times because the entries are made daily. The customer's order furnishes one entry, the foreman's report furnishes another and the copy of the shipping order, which is given to the production department the morning after the shipment is made, furnishes the final entry. The number of machines actually finished and ready for shipment is always available. The quantity of machines that are in course of erection and their approach to the finished state, is a matter that the production chief keeps in touch with daily.

On the first of each month the production department fills in the sheets covering the monthly inventory of finished machines on hand and also the report showing the number of machines of each kind and size built during the month. See Fig. 2. The entire product of this factory is divided into seventeen different groups or classifications. All of the monthly inventory sheets for each classification

Form 13-P PRODUCTION & SALES RECORD													
<i>Threshing Machines</i>													
		1911	1912	1913	1914	1915	5 Year Average			5 Year Average			5 Year Average
#21 Machine	MADE	40	50	50	60	70	54						
	SOLD	40	47	50	60	72	54						
#22 "	MADE	20	30	30	40	40	32						
	SOLD	18	24	33	35	43	31						
#23 "	MADE			20	20	30							
	SOLD			11	26	28							
#24 "	MADE	40	20	20	30	40	30						
	SOLD	34	29	34	31	36	29						
#25 "	MADE	30	40	40	50	50	42						
	SOLD	27	34	43	52	51	41						
#26 "	MADE				30	30							
	SOLD				22	34							
TOTAL		SOLD											
		MADE											
		SOLD											
		MADE											

Fig. 3—The production and sales record gives a complete statement of the sales of each machine during a five-year period. It is used as a basis in planning the production for the following season's business. The sheet fits in a loose leaf binder and is 10 x 13 in.

SAW MILLS			
Shop No.	- 9747		Size 4-A
Shipped to	Johnson & Johnson Youngsiding 2 M.		
Agents Name	J. W. Brown		
Date Set Up	7/16	Shipped	7/16
52" D.H. Double Tooth - 7 & 8 in. Saw			
Mandrel Pulley	18"	Dia.	12" Face
		Double belt	Feed
With			
20 Ft. Carriage 60 Ft. 0" Track 2 No. 539			
H. D. Blocks with	Pony	Dogs	
Set-Out Attachments	No		
Lumber Truck Irons	Chain	Set Works	
Carriage wheels 7 1/2" Dia. 1 1/8" Bore			
Saw Mandrel 8" longer than regular			
Complete per 1916 Catalog			
Signed J. D. McL.			

Fig. 4—The packer's card conveys to the production department complete information, including the number of every machine shipped

are totaled and recorded on a comparative sheet. It is thus easy to compare the values of the different classifications on hand, not only with the preceding month but also with the corresponding months in

the previous years. The total of all the classifications is treated in the same manner. This report goes to the management and furnishes a means to prevent overstocking or understocking of finished machines.

Fig. 3 shows the "Production and Sales Record" sheet. This exhibits the quantity of each size and style of machine made, the quantity sold year by year and the average for each five years, as a check. This record is made up from the machine record sheets shown in Fig. 1. At the foot of the production and sales record sheet a yearly total is inserted, which indicates the total quantity of machines built and sold in each group but without reference to sizes. The five-year average also is taken into consideration.

The lines manufactured in this factory are many and varied, and the forms were designed to record each and all groups, without changing the printed headings or making many insertions in long hand. When the time comes around each year to issue the estimated sales or stock order, the records of the production department furnish complete information as to the sales of previous years. The estimated sales sheet is made up from this information, but is governed by the outlook for the season ahead.

HANDLING ORDERS FOR REPAIR PARTS

The shipping of the completed machine to the customer in many cases does not end the manufacturer's interest in it. This is particularly true as regards agricultural machinery. The manufacturer must be prepared to provide repair parts for any machine, which may have changed hands several times, even after the lapse of many years, and upon the most meager information. In the early days, when the number of patterns was limited and the volume of business small, the question of furnishing correct repairs was generally settled by reference to memoranda kept by foremen or workmen. Often the repair part was shipped solely on the say-so of some one person who had erected the

A. B. FARQUHAR COMPANY, LTD			
SAW-MILL RECORD			
SHOP No.	9745	ORDER No.	54701
DATE SHIPT	Feb 11-1916		
SIZE	4A	R. H. L. H.	Double Belt FEED
CUSTOMER	Johnson & Johnson		
SALES AGENT	J. W. Brown		
Mandrel Pulley	18"	Dia.	12" Face
20 ft. carriage	60	ft. ways	
Head Blocks No.	539	with	Pony dogs
Carriage wheels	7 1/2"	Dia.	1 1/8" Bore
Set works	Chain		
Remarks	Complete as per 1916 Catalog		
Saw Mandrel 8 inches longer than regular			
52" Double Tooth Saw. 7 & 8 in. D.H.			
SHOP No.	9746	ORDER No.	
DATE SHIPT			
SIZE		R. H. L. H.	FEED
		DRIVE	

Fig. 5—Information is copied from the packer's card to the permanent record sheet of the production department. These are filed in a loose leaf binder in the order of the shop numbers. Each record sheet, 10 x 13 in., has space for three records on each side

machine in question, or other machines similar to it and who could visualize that machine and know, in the majority of instances, what part or parts the customer wished to secure. With the increase in the number of different types of machines built, and with a large increase in the volume of sales each year, it becomes impossible to depend on such crude methods for the correct shipment of repair parts.

The ordinary farm machine, for example, consists of hundreds of parts in each machine. A slight change in design may mean the substitution of ten, twenty or thirty new parts for the parts formerly used. The same applies to a change in a grain drill, a portable sawmill or a traction engine. It is evident that some other method than scattered memoranda is necessary to keep track of the changes that are made from year to year, and in some instances oftener. The drafting room must keep all old tracings so that they are readily accessible. As each machine is designed, a complete list of parts should be made, including even the ordinary bolts, rivets, etc. When a change is made in the design, the change is either noted on the original tracing, or a new tracing is made, together with a new list of parts. Every tracing and every list of parts must be dated. Whenever it is possible to note the date of the change, it is advisable to do so.

It is not possible to keep track of machines, after they are shipped, either by customer's name or location. Therefore each machine leaving this factory has firmly attached to it a brass name and number plate. The designating number is stamped in the plate when the erecting of the machine is completed.

When a machine is being packed for shipment a card known as the "packer's card" is filled in by the party in charge and turned in to the production department the day the machine is shipped. Fig. 4 shows the card used for reporting sawmills. The information is then copied from the packer's card to the sawmill record loose sheet, Fig. 5. When the loose leaf record sheets are placed in the binder they form their own index as the shop number of the machine regulates the position of the sheet. The packer's card is filed separately.

The information on these records is so complete that the proper part can be furnished if the machine number is given. Repair parts thus can be ordered by the shop number of the machine. If that number is given the order can be filled correctly. It sometimes happens that the shop number has been removed from the machine and in an instance of this kind the only thing is to send the old part back to the factory to be duplicated, if the machine has been out any length of time. The "order-by-number" idea has spread rapidly during the last decade.

The matter of proper records so as to be able to fill repair orders promptly has more than one side. From the manufacturer's standpoint there is the satisfaction of shipping to the customer the correct repairs promptly and the thought that the service to the customer did not cease with the shipment of the original machine. From the customer's viewpoint the needed repairs should be shipped within a few hours from the time that his order is received in the manufacturer's office. This is not always possible because no manufacturer could keep duplicate or triplicate sets of all parts on hand at all times. At times, parts of the equipment are broken through the results of an unusual accident and the part broken is one which would never break from ordinary wear. Patterns are stored for many years after the machines for which they were designed have become obsolete, and if the casting must be

secured from an outside source, there will naturally be a few days' delay.

The records are kept by the production department because it is constantly in touch with the output from each factory department, and is therefore in a position to catch any mistakes that might be made by the packers the day the mistake is made. A month later would leave the matter in a state of confusion and doubt. If these records were kept by any other department there would be much duplicated work, as the other department would have to go out in the factory and gather the information which the production department absorbs naturally in the course of its regular duties.

Storage Battery Truck of Dumping Type

The successful application of electric storage battery trucks for handling material in various manufacturing plants has resulted in the further adoption of these trucks for the transfer of bulk materials and the bringing out of an electric dump truck for this purpose.



A Side Dump Truck of All-Steel Construction Propelled by a Storage Battery

The accompanying illustration shows a new truck of this type that is being placed on the market by the Elwell-Parker Electric Company, Cleveland, Ohio.

This truck is built with either an end or side dump body and in capacities of 22½ and 36 cu. ft. The end dump type is provided with a hand winch to draw the body back to a horizontal position without the operator leaving the truck. The side dump truck is equipped with a balanced hopper which is easily tipped to either side by releasing a latch located immediately in front of the truck operator.

The trucks are furnished with either fixed or detachable hopper equipment. The latter type with the hopper removed can be used for various handling purposes. The fixed hopper truck is adapted for handling such material as chips, small castings, foundry sand, ashes, coal, chemicals, etc., and is said to be very economical in operation.

The truck is of all-steel construction, is provided with totally inclosed worm drive and is fitted with solid rubber tires. It can be operated by ordinary common labor.

How to make a shop magazine has been summarized by Arthur T. Morey, assistant to the president of the Commonwealth Steel Company, St. Louis, and editor of the *Commonwealth*, published by that company. His observations are of course of chief interest to a company contemplating a shop paper, and a reprint of them in bulletin form has been made and can undoubtedly be had by applying to the National Safety Council, W. A. Cameron, Continental and Commercial Bank Building, Chicago. Incidentally, Mr. Morey is now president of the National Safety Council. A good, modern, up-to-date company, he emphasizes, does not exist for its stockholders alone, or just for its management, or only for its workmen. It should exist and be conducted for the benefit of them all. The shop magazine "can help idealize and actualize this."

The Electrically Driven Reversing Mill*

Comparison of the Relative Advantages of the Steam Engine and the Reversing Motor for Driving Blooming Mills

In making a decision whether to adopt steam engine or electric drive for reversing rolling mills there must be taken into account: 1. First cost; 2. cost of operation; 3. energy saved during reversal; 4. power consumption with partial load; 5. economy of time in operation. It has been claimed that the steam engine is the equal or superior of the electric drive on all these points. This contention can be answered by means of data already available from electrically driven reversing mills in operation in the United States.

FIRST COST

The first cost depends not only on the type of engine or motor adopted, but upon the auxiliaries required for each, and also upon the arrangement of the plant. The auxiliary engine equipment will include the boiler plant, coal and ash handling facilities, coal storage, piping, condensing apparatus and foundations. The electric drive will require, in addition to the motor, a flywheel motor-generator set and the generating equipment in the power house. If power is purchased, only the driving motor, motor-generator set and control apparatus are necessary. Table I compares the first cost of an electric drive with that of a steam engine drive for a 40-in. blooming mill to roll 60,000 tons of steel per month. The figures given therein do not bear out the statement that the first cost of the reversing engine is only a small fraction of the aggregate cost of an electric drive.

Table I—Comparison of First Cost of Steam and Electrically Driven Reversing Mills

Electric drive with purchased power:	
Complete cost of reversing motor, flywheel motor-generator set, exciters and control equipment..	\$185,000
Foundations, wiring, etc.....	10,000
Total	\$195,000
Electric drive with power generated at plant:	
Complete cost of reversing motor, flywheel motor-generator set, exciters and control equipment..	\$185,000
Foundations, wiring, etc.....	10,000
Proportion of power house cost, 2500 kw., at \$50 per kw.	125,000
Transmission and outside wiring.....	5,000
Total	\$325,000
Steam drive:	
Compound reversing engine.....	\$125,000
Condenser, exhaust piping, including pumps.....	25,000
Foundations	10,000
Boilers, 2500 hp., including stokers, coal and ash handling plant, at \$30 per hp.....	75,000
Steam piping with covering, valves, etc.....	15,000
Water tunnel for condenser with discharge 8500 gal. of water per minute.....	50,000
Total	\$300,000

COST OF OPERATION

Under normal operating conditions, with a 5000-hp. turbine generating power for the electric drive, and operating at 70 per cent of load, 1 hp. hr. can be generated with 13.6 lb. of steam. Table IV shows the horsepower required by an electrically driven reversing mill under different conditions of operation. The steam required can easily be calculated, and compared with the steam consumption of engine driven mills as exhibited in tables II and III. Tables II and III are from a paper by Karl Nibecker, steam engineer, Youngstown Sheet & Tube

Company, Youngstown, Ohio, before the Engineers' Society of Western Pennsylvania. According to these figures the steam consumption of the electrically driven mill will range from 50 to 60 per cent of the engine-driven one.

Table II—Steam Consumption of Reversing Steam-Driven Blooming Mill—Pounds of Steam Per Ton

No.	Size			Elongations	Lb. Steam Per Ton
	Ingot		Bloom		
A	20 x 22 in.	6	x 7 in.	9.04	587
B	20 x 22 in.	6	x 7 in.	9.04	490
C	20 x 22 in.	6	x 7 in.	9.04	497
D	20 x 22 in.	6	x 7 in.	9.04	520
E	20 x 22 in.	6	x 7 in.	9.04	518
F	20 x 22 in.	6	x 7 in.	9.04	575
G	20 x 22 in.	3 1/4	x 7 3/4 in.	15.10	767
H	20 x 22 in.	3 1/4	x 7 3/4 in.	15.10	610
I	20 x 22 in.	3	x 11 3/4 in.	10.75	694
J	20 x 22 in.	3	x 11 3/4 in.	10.75	625
K	18 x 32 in.	4 1/2	x 23 3/4 in.	5.13	522
L	18 x 32 in.	4 1/2	x 23 3/4 in.	5.13	423
M	19 x 46 in.	4 3/4	x 36 1/2 in.	4.63	356
N	19 x 46 in.	4 3/4	x 36 1/2 in.	4.63	292

Table III—Steam Consumption of Reversing Steam-Driven Blooming Mill

Size			Number of Elongations	Lb. Steam Per Ton	Lb. Steam Per Ton at	
Ingot	Bloom	5-Elong.			9-Elong.	
20 x 22 in.	3 x 11 3/4 in.	11.50	643	444	591	
20 x 22 in.	3 1/4 x 7 3/4 in.	15.00	600	375	505	
20 x 22 in.	6 x 7 in.	9.00	495	350	495	
18 x 32 in.	4 1/2 x 23 3/4 in.	5.00	420	420	...	
16 x 32 in.	5 x 29 in.	3.25	280	...	...
19 x 46 in.	4 3/4 x 36 1/2 in.	4.75	300	...	...
18 x 32 in.	3 x 23 1/2 in.	7.50	410	256	...	

Table IV—Electrically Driven Reversing Mill

Ingot	Bloom, In.	Elongation	Hp-hr. Per Ton	Remarks
18-in. round	7 3/4 x 7 3/4	4.66	11.4	High Carbon
18 x 20 in.	3 x 8	12.20	23.0	High Carbon
18 x 20 in.	2 x 16	9.20	19.4	Soft Steel
18 x 20 in.	4 x 4	18.50	26.0	
15 x 17 in.	4 x 4	16.00	24.0	
20 x 20 in.	5 x 5	16.00	25.5	
20 x 20 in.	8 x 8	6.25	17.0	

SAVING OF ENERGY

Comparisons of the saving of accelerated energy by the electrically driven mill and the steam engine driven mill are difficult since the characteristics of engine and motor are essentially different. Ideal operation will cause the metal to leave the rolls at practically zero speed, all the energy in the mill then having been returned and usefully consumed. This ideal condition of operation is not possible and the equipment should be designed so that power consumption is not materially affected by unskillful operation. The speed of the reverse in the motor is proportional to the throw of the controller handle and does not vary appreciably with the load. Ideal conditions, therefore, can be more nearly approached than with the steam engine. The steam engine will often race after the metal has left the rolls, especially if the draft has been heavy. The engine must be stopped and energy is required to do it. In the case of the electric drive, the motor is stopped by requiring it to act as a generator. This enables the braking to be done rapidly and also economically, as the energy stored in the rotating apparatus is returned to the flywheel of the motor-generator set. The only losses are those due to the resistance of the winding. The point of energy saved, however, is of little importance as it appears in the relative power consumption of the two methods of drive.

*From a paper presented by Wilfred Sykes and David Hall before the American Institute of Electrical Engineers, Cleveland, June 27-30.

POWER CONSUMPTION WITH PARTIAL LOAD

With the electrically driven mill, the economy falls off somewhat with a decrease in the output. This is due to the continuous windage and friction losses of the flywheel motor-generator set, which are independent of the load on the machine. Aside from these losses, the unit power consumption has but little effect where one to thirty ingots are rolled per hour. That is, unit power consumption per ton of steel is independent of the quantity rolled. A similar condition exists with the steam engine, which has certain constant losses due to leakage, piping and auxiliary power. Outside of these losses, however, the steam consumption will not be constant per unit of work done, as the expansion conditions in the engine vary.

ECONOMY OF TIME

The time required for operation is largely governed by conditions entirely outside of the time required for actually rolling metal. While the steam engine can reach certain given speeds more quickly than can the reversing motor, the engine will not necessarily roll a greater amount of metal than the motor. The amount of metal depends, among other conditions, upon the way the metal is handled on the tables, the maximum speed reached and the time lost in manipulating the driving unit.

Table V is a comparison of the time required for various passes on an engine-driven and a motor-driven mill respectively. These figures are not intended to show the advantage of one over the other

Table V—Elapsed Time, in Seconds, for Rolling Ingots in Steam and Electric Driven Reversing Mills

	Pass No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engine Drive.....		0	3.5	9.7	13.0	17.2	20.8	27.2	31.8	37.0	42.0	50.0	55.0	62.0	67.7	75.8
Motor Drive.....		0	3.2	9.4	12.7	15.6	18.8	26.0	29.2	31.8	35.7	41.4	44.7	48.5	53.4	59.8

system of driving, but indicate that in practice the reversing motor will operate just as quickly, if not more quickly, than the engine. Due to the ease of control of the motor, the operator is able to continue running the mill at the maximum capacity with less fatigue than in case of a steam-driven mill.

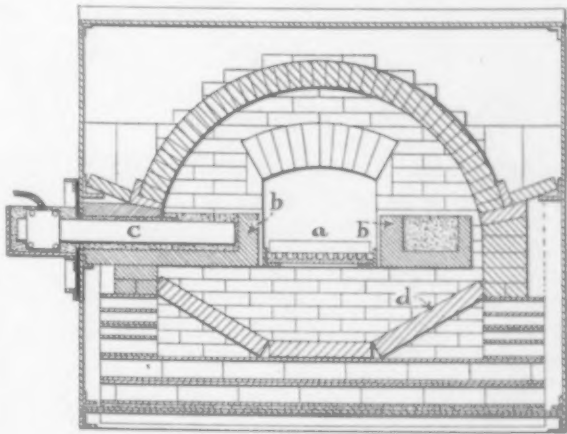
Table VI presents statistics of three successful reversing motor-driven mills. The first is that of the Steel Company of Canada, at Hamilton, Ont., which was the first successful installation of a reversing motor-driven blooming mill. The installation consists of a double reversing motor, capable of developing a maximum of 10,000 hp., which is supplied with power from a flywheel motor-generator set with two generators. The Bethlehem installation is the largest at present in operation. It drives a 25-in. blooming mill at the Lehigh plant. Both it and the Hamilton installation have double motors, due to the amount of power required. The third installation is that of the Central Steel Company, Massillon, Ohio, which is somewhat similar to the other two excepting that a single motor is used, the capacity being approximately 8000 hp.

Table VI—Statistics of Motor-Driven Mills

	Hamilton	Bethlehem	Massillon
Size of ingot, in.....	15 x 17	19 x 23	18 x 20
Weight, lb.....	4,000	10,000	5,000
Size of finished material, in.....	4 x 4	4 x 4	4 x 4
Elongation	16	10-12	Up to 20
Number of passes.....	19	17-21	19-21
Capacity, tons per hour.....	60	100	60
Roll diameter, in.....	30	30	30
Pinion diameter, in.....	34	35	34
Speed, full motor field, r.p.m.....	70	40	50
Speed, weakened motor field, r.p.m.....	100	120	120
How driven from motor.....	Direct	Direct	Direct
Number of motors.....	2	2	1
Voltage across each armature....	600	600	700
Maximum operating torque, ft.-lb.....	900,000	1,550,000	750,000
Maximum motor horsepower.....	10,000	12,000	8,000
Number of generators.....	2	2	1
Rated horsepower of driving motor of set.....	1,800	2,000 kw.	1,500
Weight of flywheel, lb.....	100,000	100,000	60,000
Speed of flywheel set, r.p.m.....	500	375	375

Electric Heat-Treating Furnace

Heat treating of electricity in an electrical resistance furnace is the subject of a patent (U. S. 1,176,018—March 21, 1916) granted to T. F. Bailey and F. T. Cope of Alliance, Ohio. It has been assigned to the Electric Furnace Company of that



Cross-Section of an Electric Heat-Treating Furnace

city. The illustration shows a cross section of the furnace. The arched roof reflects down upon the hearth the heat from the granular carbon resistance elements. The material to be treated rests on the hearth. Extending the length of the furnace on each side of the middle space, a, are troughs, b,

which hold the granular coke or charcoal. At each end of these resistance elements are the electrodes, c. From these the heat rises to the arched roof from which it is reflected back on the material. The inclined walls, d, are also located below the resistance elements so as to send back the heat to the hearth which is radiated downward. By this construction it is claimed that the majority of the heat radiating from the resistance material as heat rays will be reflected back toward the hearth from all directions, tending to concentrate the greater part of the heat within the heating chamber on the hearth.

Women Employees in British Shipyards

The woman worker has appeared in the British shipyard. According to the London Times, six firms on the northeast coast are now giving employment to some hundreds of women in their yards, so that the capacity of women for undertaking this class of work is being seriously tested. Their present work is stated to be of a character calling for only limited skill. They perform arduous work, however, such as scraping, painting, bolt screwing and countersinking. As the men continue to go to war, a considerable increase is expected in the number of women shipyard employees. The attempt to introduce women workers into so important an industry as shipbuilding is being watched with keen interest, says the same paper—an interest which is accentuated by the knowledge that competition in shipbuilding is likely, with the advent of new rivals, to enter a more strenuous phase after the war.

The No. 2 furnace of the Woodward Iron Company, at Woodward, Ala., was out 21 days in June for relining. The second Vanderbilt stack of this company was blown in June 10. All five furnaces are now in blast.

Crystallization in Cold-Worked Steel*

Causes of Grain Growth in Cold-Pressed and Cold-Drawn Parts, and the Remedies—Effect of the Carbon Content

—BY RALPH H. SHERRY—

AN article of interest to manufacturers using various forms of cold-worked, low-carbon steel was published in the *Bulletin* of the Society of Automobile Engineers for May, 1916. The author has investigated the occurrence of coarse crystallization or grain growth in low-carbon steel with a number of commercial materials, particularly hot-rolled rod, cold-drawn wire, hot and cold-rolled sheet, cold-rolled strip, cold-drawn tubing, and pressings. In the manufacture and use of these materials mysterious epidemics of breakage have appeared from time to time, often only aggravated by the use of treatments supposed to put the steel in the best possible condition. Material supposed to be of fine grain would frequently break with a coarsely crystalline fracture.

Recent investigations, of which a brief survey is given, have thrown considerable light upon this phenomenon, and methods of prevention and cure for many materials have been determined. According to the author, "the formation of coarse grains in low carbon steel will follow the action of a limited amount of strain exceeding the elastic limit and subsequent annealing within certain temperature ranges. This has been confirmed by all investigators."

In the writer's investigations it was noted on varying by narrow steps the amount of strain within the range mentioned that the less the applied strain the greater was the grain size on subsequent annealing. Within the limiting range of strain and near the lower limit there seems to be a definite or "critical" strain below which the range of temperature within which grain growth occurs is limited by the A_1 , A_2 thermal critical points (about 690 and 780 deg. C.—1275 and 1435 deg. Fahr.). When the material is strained beyond this point, the annealing range is considerably extended, falling between about 650 and 900 deg. C. (1200 and 1650 deg. Fahr.). The moderate grain growth occurring below 650 deg. C. (1200 deg. Fahr.) noted by other investigators was not found

in the author's investigation. This "critical" strain mentioned above has not been noted by other investigators, but the quantitative effect of strain on the grain size has been partly confirmed by the work of Chappell.

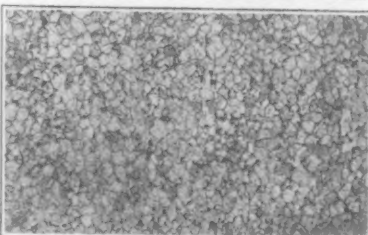
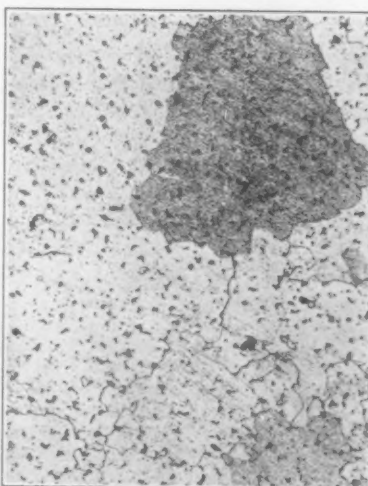
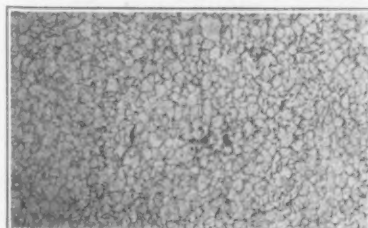
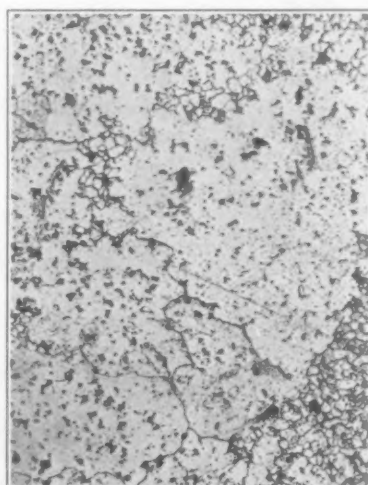
DETAILS OF EXPERIMENTS

The experimental operations were carried on by forging, cold-drawing, cold-rolling and cold-pressing, i. e., stamping. The reduction of area, with its origin at the elastic limit, was selected as the standard of measurement in the quantitative determinations on account of its convenience and ready application.

Some coarse crystallization was produced in hot-rolled rod by hammering cold and subsequently annealing within the temperature ranges mentioned. None was noted in hot-rolled rod or annealing after the rolling operations.

Samples of hot-rolled rod of from $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter were drawn to various sizes and samples from each draft annealed at temperatures between 650 and 900 deg. C. (1200 and 1650 deg. Fahr.). No grain growth was found outside of this range. In a number of tests the amount of reduction was varied by as narrow steps as possible, in some cases 0.001 in. These samples were annealed at various temperatures within the range mentioned. It was found that within certain limits the grain size after annealing is inversely proportionate to the applied strain, decreasing gradually with increasing strain until the normal size is reached, with reductions of area of about 25 to 30 per cent.

In these experiments it was noted that with reductions of about 9 per cent or less, the temperature range within which grain growth occurs on annealing lies between about 690 and 780 deg. C. (1275 and 1435 deg. Fahr.), annealing above the higher temperature completely refining the grain. The only exception noted was in cases where the action of the strain was irregularly distributed. On the other hand, when the reduction of area is greater than about 9 per cent, the range of temperature within which grain growth occurs on annealing falls between about 650 and 900 deg. C. (1200 and 1650 deg. Fahr.). There is apparently a "critical"



Effect of Cold Work and Annealing on a Rod 0.320 in. in Diameter, Drawn and Annealed. Photomicrographs are reduced one-half from an original of 100 diameters. They represent an 8 per cent (upper) and a 9 per cent (lower) reduction material, annealed 1 hr. at 700 deg. C., the small photomicrograph in each case showing the same reheated to 790 deg. C.

*Abstract of a paper presented at the semi-annual meeting of the Society of Automobile Engineers, June 12-16, 1916. The author is metallurgist of the General Motors Company, Detroit, Mich.

strain occurring at about 9 per cent reduction of area. Little or no effect was produced by reductions of area below about 8 per cent. Photomicrographs illustrating clearly the quantitative effect of strain are shown.

These results were checked by a number of similar experiments. Some difficulty was encountered in duplicating the results, especially with the lowest reductions, owing to slight variations in the diameter of the rod or to its being slightly out of round, the effect at times being confined to the periphery or to local areas. Somewhat similar results were obtained with cold-rolled strip.

The same conditions were found to occur in certain cold-pressing operations. In pressings of the cup type the greatest amount of strain occurs at the periphery of the blank, reaching a minimum at the bottom of the pressing. On annealing typical pressings within the temperature ranges mentioned, grain growth was found to occur, of greatest extent near the bottom where the strain was the least, and decreasing gradually toward the top, where the maximum strain was applied. The same "critical" strain noted in the cold drawing was found in these pressing operations. The effect is illustrated in the photomicrographs shown.

GRAIN GROWTH AND PHYSICAL PROPERTIES

The presence of coarse crystallization has considerable effect upon the physical properties. The resistance to shock and the tensile properties are noticeably affected. In tests made it was found that the elastic limit, maximum strength, and elongation are all lowered.

The author discusses at length the occurrence of coarse crystallization in commercial materials such as sheet and strip steel, tube, cold-drawn rivet steel and cold-pressings. In hot-rolled sheet no grain growth was found in sizes heavier than 0.130 in., but was common in all thinner sheet down to 0.065 in., the lightest size examined. The grain growth was generally moderate, usually being between 0.08 and 0.12 mm. diameter. In some cases grains as large as 0.40 mm. diameter were noted, usually in the heavier sizes. Where grain growth was found in cold-rolled annealed sheet it was generally coarser than that found in the hot-rolled. Sheet of decided coarse grain may give serious trouble in certain operations such as pressing. When it is necessary to refine such material annealing above 790 deg. C. (1450 deg. Fahr.), or in some cases above 900 deg. C. (1650 deg. Fahr.), is necessary.

On a commercial scale the detection of grain growth is rather difficult when applied to sheet, re-

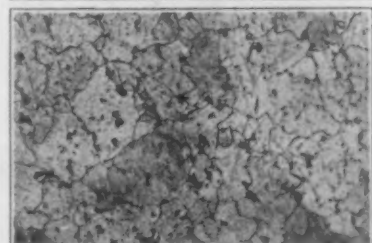
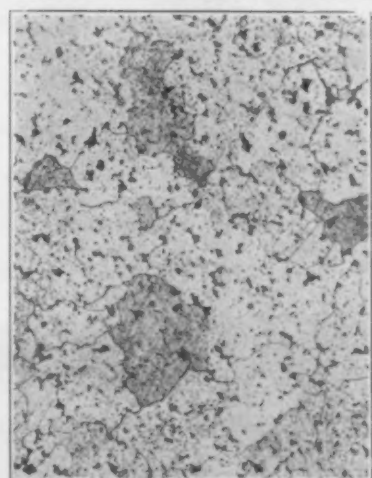
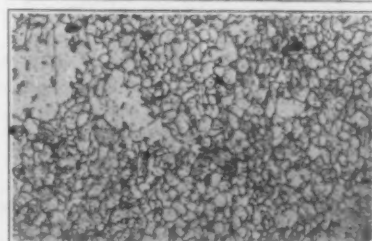
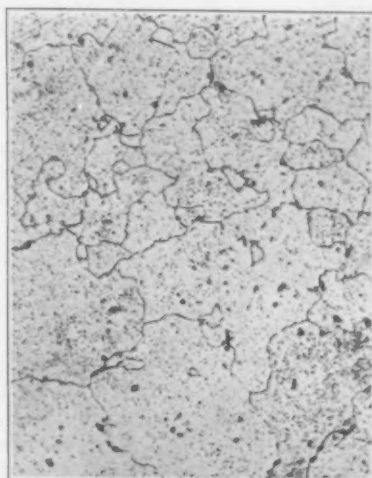
quiring the combination of a microscopic examination and a tensile test.

OCCURRENCE OF GRAIN GROWTH

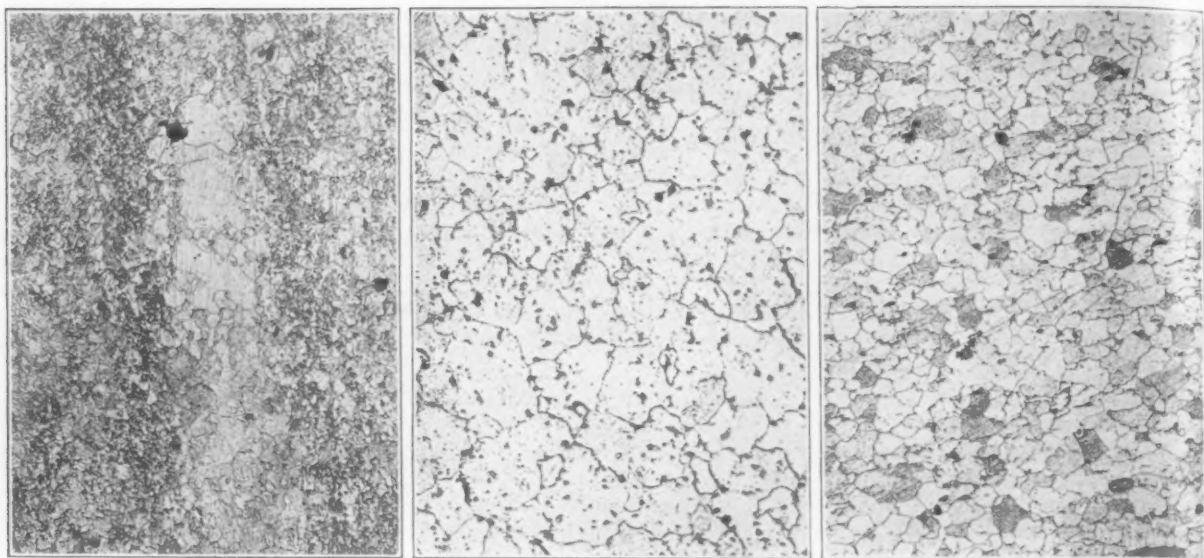
The prevention of grain growth in hot-rolled sheet requires the control of a number of factors rather difficult to regulate. To insure its absolute elimination, annealing above 900 deg. C. (1650 deg. Fahr.) is required. The difficulty of annealing sheet at this high temperature is obvious, although box annealing should be feasible. Somewhat the same conditions apply to cold-rolled sheet, where control of the reduction of area, a decidedly difficult factor to control, is necessary.

Grain growth may readily occur after certain cold pressing operations. Where 0.20 carbon steel can be used, no grain growth will occur, but in the usual practice low-carbon steel is used in which grain growth can readily be produced. Where the pressing operations are light improper annealing will cause grain growth, and control of the annealing temperature is of the utmost importance in such cases. The annealing of pressings is usually looked upon as an operation requiring only elementary control, the main consideration being that the metal reach a temperature high enough to soften it. The usual tendency is to keep the temperature up and so it may frequently rise within the dangerous range. The selection of the proper annealing temperature depends to some extent upon the nature of the operation and the condition of the metal. Certain upsetting operations require annealing at temperatures slightly above 690 deg. C. (1275 deg. Fahr.) and a few pressing operations are of this nature. In such cases or where a decidedly coarse-grained structure exists in the metal, annealing it at about 790-800 deg. C. (1450-1470 deg. Fahr.) may refine it sufficiently; if not, 900 deg. C. (1650 deg. Fahr.) will be required. Temperatures between 600 and 650 deg. C. (1110 and 1200 deg. Fahr.) are usually sufficiently high to remove the effect of cold work. In the case of pressings, annealing just below 690 deg. C. (1275 deg. Fahr.) will usually produce grain growth so slight that it will not be the cause of any trouble in further operations.

Grain growth can only occur when the strain applied has been comparatively light and control of this factor, as for instance by the increase in the extent or number of the operations before annealing, will generally permit the use of any normal annealing temperature. Very often, however, the effect of the operation cannot be foretold and some variation from normal may occur resulting in a comparatively light strain in some unexpected place.



Effect of Cold Work and Annealing on a Rod 0.320 in. in Diameter, Drawn and Annealed. Photomicrographs are reduced one-half from an original of 100 diameters. They represent a 10 per cent (upper) and an 11 per cent (lower) reduction material, annealed 1 hr., at 790 deg. C., the small photomicrograph in each case showing the same reheated to 790 deg. C.



Grain Growth in Ferrite Band of Hot-Rolled Sheet, 0.18 Per Cent Carbon

Reduction 12.5 Per Cent, Annealed 1 Hr. at 700 Deg. C.

Reduction 16 Per Cent, Annealed 1 Hr. at 700 Deg. C.

Photomicrographs reduced about 40 Per Cent, from an original of 100 diameters

Grain growth, usually of a moderate size, generally occurs on the edges of annealed blanks, following the action of the blanking press. Where further work is applied to the blank before annealing, grain growth does not usually occur. This same condition may occur around punched holes. Grain growth will occur following certain light bending operations if the annealing temperature is not properly controlled.

PREVENTION OF GRAIN GROWTH

General methods of prevention and cure are given by the author. The control of the annealing temperature as mentioned is of primary importance. Where grain growth has occurred and refining becomes necessary heating above 900 deg. C. (1650 deg. Fahr.) will refine the grain completely. If the scale produced should be troublesome, the material may be quenched in water, subsequently annealing at 540 to 675 deg. C. (1000 to 1250 deg. Fahr.) if necessary. A little concentrated hydrochloric acid thrown into the furnace at the start will loosen the scale so that it can be readily removed. In many cases annealing at 790 deg. C. (1435 deg. Fahr.) will refine the grain sufficiently to prevent further trouble. To summarize, it is stated that grain growth in low-carbon steel can be

avoided by the use of comparatively heavy operations on the metal before annealing, or by proper selection and control of the annealing temperature according to the working conditions. If the material is not annealed, no grain growth can occur.

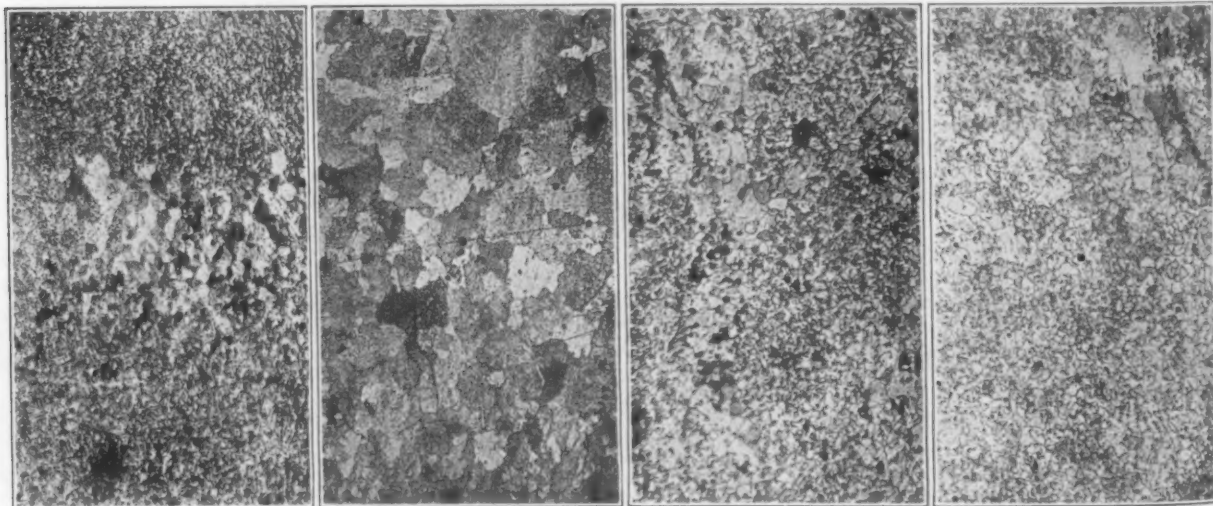
The table accompanying the photomicrographs will illustrate this effect. This example is selected from a number of tests tabulated.

Hot Rolled Rod 0.320 In. in Diameter			
After Drawing		Grain Size in Mm. After 1 Hr. at	
Diameter, Inches	Reduction of Area, Per Cent	700 Deg. C. (1290 Deg. F.)	800 and 850 Deg. C. (1470 and 1560 Deg. F.)
0.309	6.5	0.02	0.02
0.307	8.0	Some 0.02; rest 0.40 to 0.80	0.02
0.305	9.0	0.28 to 0.56; a few 0.02	0.02
0.303	10.0	0.25 to 0.40; a few 0.02	0.02; some 0.18
0.302	11.0	0.20 to 0.25	0.20 to 0.25
0.300	12.0	0.15	0.15
0.297	16.0	0.07	0.07

The author's conclusions are as follows:

1. Grain growth in low-carbon steel may be produced by permanent deformation within certain limits, followed by annealing within certain temperature ranges.

2. The greater the amount of strain applied within



Annealed at 675 Deg. C.

Annealed at 705 Deg. C.

Annealed at 790 Deg. C.

Annealed at 705 and Reheated to 790 Deg. C.

Parallel Strips Cut from Pressing. Enlarged 25 diameters. Annealed 30 minutes. The photomicrographs are reduced about one-half from the original

these deformation limits, the smaller will be the grain size produced by annealing.

3. The annealing range within which grain growth, due to strain beyond the elastic limit, may be produced, lies between 650 and 900 deg. C. (1200 to 1650 deg. Fahr.) except in certain cases where it lies between 690 and 780 deg. C. (1275 and 1435 deg. Fahr.).

4. When the applied strain falls below a certain or "critical" amount, the annealing range within which grain growth can occur seems to be limited by the thermal critical points at about 690 and 780 deg. C. (1275 and 1435 deg. Fahr.).

5. The most practical standard by which to measure the strain applied seems to be the reduction of area. Experiments based upon such measurements show that no grain growth occurs following a reduction of area of less than about 7 or more than about 25 to 30 per cent. The "critical" strain mentioned seems to be marked by a reduction of area of about 9 per cent.

6. The refining action taking place at about 780 deg. C. (1435 deg. Fahr.) is a further indication of the presence of a thermal critical point at this temperature.

7. No serious grain growth was found in steel the carbon content of which was uniformly above about 0.15 per cent.

TESTING PIPE CORROSION*

Apparatus for Securing in Three Months the Conditions After Two Years' Service

The main factors controlling corrosion in a pipe are: 1. The amount of free oxygen in solution in the water; 2. The volume of flow, which is an important factor, mainly on account of the greater amount of oxygen available; and 3. Temperature. Corrosion increases with the temperature, reaching a maximum somewhere between 160 and 180 deg. Fahr.

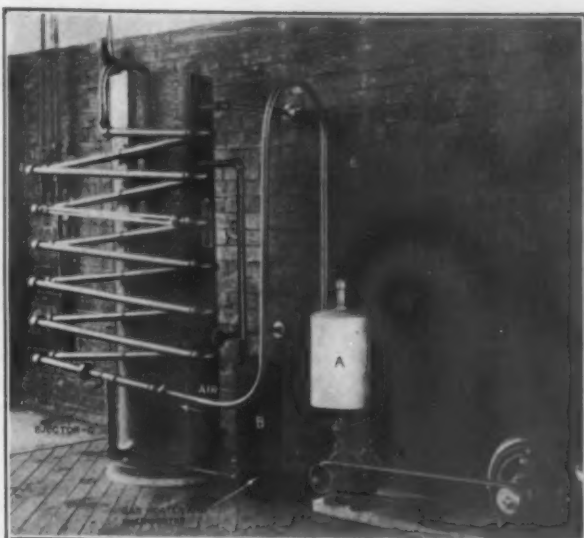
These conditions are reproduced in the apparatus shown in the accompanying illustration. This consists of a tank or reservoir open at the top, which may be filled with a supply of any kind of water selected for the test. This water is maintained at any desired temperature by means of a small gas heater *B* fitted with a thermostat, or a steam coil may be inserted if more convenient. An ejector is provided at *C* and operated by air under 3 or 4 lb. pressure. The air should first be passed through a mass of excelsior or similar material to remove oil. The heated water is thus aerated, forced up through the coil of pipe and discharged continuously into the top of the tank. The coil consists of alternate lengths of the materials under test. A glass tube may be inserted in the coil if it is desired to observe the flow. By keeping up a continuous flow in this way at a temperature of 160 to 180 deg. Fahr., the relative tendency of pipe to corrode may be determined in three to four months. The amount of corrosion found in that time with this apparatus will be found equal to about two years under the same conditions in actual service.

The acceleration of corrosion in this apparatus is principally due to the continuous flow and the greater amount of oxygen and carbonic acid which is thereby brought into contact with the interior surface of the pipe. The details of this machine may be altered according to local conditions. If the water is not fresh and almost pure, the supply should be renewed from time to time.

The amount of corrosion in both wrought-iron and steel hot-water-supply pipe, as measured by the depth of pitting, will frequently amount to about 0.1 in. in two years. We have found with this apparatus nearly this amount of corrosion in pipe of this kind in three months, with the water circulating at the rate of 1 to 2 gal. per minute. The relative depth of pitting is apparently the same in each case.

The writer has used this scheme for two years in

*Paper, substantially in full, presented on June 28, before the American Society for Testing Materials, Atlantic City, by F. N. Speller, metallurgical engineer, National Tube Company, Pittsburgh.



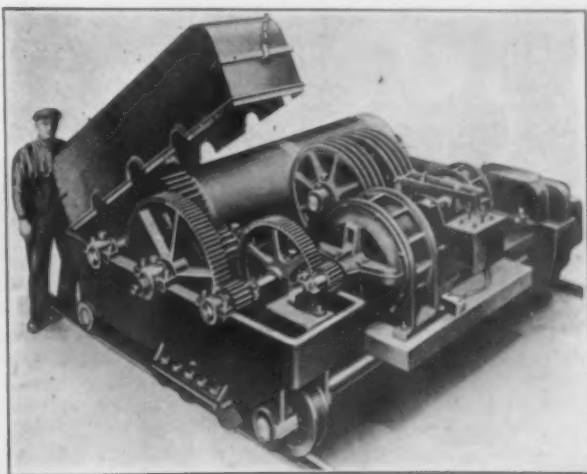
Aerated Hot Water Is Circulated Through a Series of Lengths of Pipe of Different Materials to Ascertain Their Corrosive Resistance

research work on the improvement of pipe and pipe coatings, with much saving of time compared with similar tests on pipe in actual use.

Trolley for Crane Handling Locomotives

The Whiting Foundry Equipment Company, Harvey, Ill., has recently completed one of the largest alternating-current cranes ever built for handling locomotives. The crane, which was supplied to the Seaboard Air Line for its new shops at Portsmouth, Va., has a capacity of 160 tons and there are two 80-ton trolleys, one of which is equipped with a 10-ton auxiliary hoist.

All the gears of the trolleys run in an oil bath. The motor pinion has an outboard bearing and the idler sheaves are mounted on a separator instead of being hung on. This latter arrangement enables the operator to inspect the hoisting rope and oil the sheaves while standing on the top of the trolley in addition to increasing the lift of the crane by approximately 30 in. All the shafts in the gear train are on the same line and with the exception of the drum shaft do not extend across the trolley. The pinions and the drum gear are forged. Steel castings are used for the trolley sides



One of Two 80-Ton Trolleys for One of the Largest Alternating-Current Cranes Ever Built for Handling Locomotives

and separator. The housing is of structural steel and contains the handholes required for inspection and easy removal of parts for making repairs.

The Charleston Steel Company, Charleston, W. Va., maker of simple and alloy steels, has opened general sales offices at 111 Broadway, New York, under the management of Atkinson & Utech, Inc. The company will specialize in electric-furnace steel.

TESTS OF ALUMINUM BRONZE*

A Double Heat Treatment Increases the Resistance to Alternating Stresses

Aluminum bronze subjected to a double-heat treatment of quenching followed by annealing, has its proportional limit raised without any great sacrifice of ductility, and at the same time is so improved in quality as to offer much greater resistance to alternating stresses. In this respect its qualities approach those of steel. These facts were determined by a series of tests in the Landgraf-Turner and White-Souther testing machines of a series of alloys, both with and without heat treatment.

ALTERNATING AND REPEATED STRESS TESTS

In the Landgraf-Turner machine, a $\frac{3}{8}$ -in. cylindrical specimen was bent backward and forward through a small angle by blows of a hammer, the number of blows required to produce fracture being automatically recorded. Tests of several alloys were made, with slots of $\frac{3}{8}$ in. and 1 in. between the hammers, the latter giving

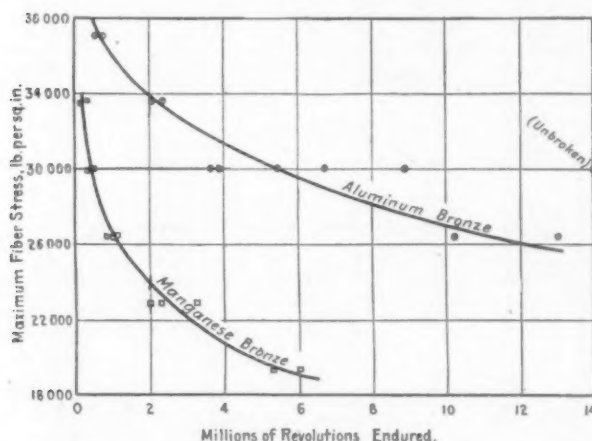


Fig. 1—Stress-Endurance Diagrams for White-Souther Tests. ing a less severe test. The character of the alloys and the average number of alternations of stress required for each of the specimens, without heat treatment, to produce failure is given in Table I.

Table I—Results of Landgraf-Turner Endurance Tests

Alloy No.	Name of Alloy	Additional Constituents	Alternations to Produce Failure	
			Stand-Endurance Test $\frac{3}{8}$ -In. Slot	Endurance Test 1-In. Slot
3	Phosphor-bronze	11% tin	75	1,437†
5	10 per cent aluminum bronze	1% iron	4,485	5,220
		41% zinc		
29	Manganese bronze	1% iron		
		1% tin	165	383
		$\frac{1}{2}$ % Mn.		
		$\frac{1}{2}$ % Al.		

†1-in. slot between hammers.

The results of the tests on alloys Nos. 5 and 29 are fairly comparable with tests of steel rails and axles. Alloy No. 5 gave results far superior to steel, and had a remarkable endurance of severe alternating stresses.

The White-Souther machine more nearly reproduces the conditions of service. The specimen is revolved in the axis of a wheel at 1300 r.p.m., the ends of the specimen being loaded with weights hanging constantly downward. The number of revolutions endured before fracture varies with the fiber stress and the character of the material. Tests were made on manganese-bronze and aluminum-bronze specimens, cast half in sand and half in a chill. The physical properties were as follows:

	Manganese Bronze	Aluminum Bronze
Proportional limit, lb. per sq. in.	29,200	20,400
Tensile strength, lb. per sq. in.	87,400	76,900
Elongation in 2 in., per cent.	25.0	30.5
Reduction of area, per cent.	25.2	27.6

*Abstract of a paper presented to the American Society for Testing Materials at Atlantic City, June 30, by W. M. Corse and G. F. Comstock, Titanium Alloy Mfg. Company, Niagara Falls, N. Y.

Tests were made at maximum fiber stresses of 33,600, 30,000, and 26,400 lb. per square inch for both materials, and in addition at a stress of 37,100 lb. per square inch for aluminum bronze and 22,900 and 19,400 lb. per square inch for manganese bronze. The results of the tests are plotted in Fig. 1.

HEAT TREATMENT OF ALUMINUM BRONZE

Aluminum bronze can be hardened by quenching from a high temperature. Tests were made to determine the proper quenching temperature of the No. 5 alloy, and also to determine the effect of a short air cooling prior to quenching. Test specimens about $\frac{1}{2}$ in. in diameter were quenched from 700, 800, 900 and 1000 deg. C., and a temperature of 850 deg. C. was adopted as the proper quenching heat. One of the specimens so quenched had the following physical properties:

Proportional limit, lb. per sq. in.	39,800
Tensile strength, lb. per sq. in.	97,400
Elongation in 2 in., per cent.	1.0
Reduction of area	None
Brinell hardness number	240

Tests made to determine the effect of air cooling before quenching indicated that this treatment lowers the elastic limit of the quenched material with only a slight increase in ductility. If not over 10 sec. elapses between the withdrawal of the piece from the furnace and its immersion in water, the quenching effect will not be lessened. Nothing is gained by intentional air cooling before quenching.

The effect of annealing after quenching was determined by a series of tests in which the specimens were heated to various annealing temperatures, and

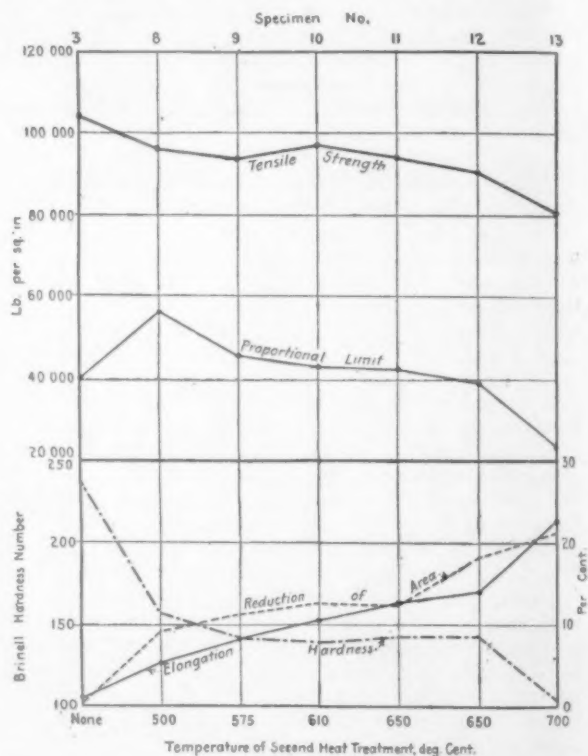


Fig. 2—Physical Properties of Specimens Annealed after Quenching from 850 Deg. C.

then cooled either in the air or in the furnace. The specimens cooled in the furnace gave better results than the air-cooled ones, the speed of cooling apparently having an important effect on the physical properties. The results of the various annealing tests on the furnace cooled specimens are plotted in Fig. 2.

To determine the effect of the double-heat treatment on larger castings, similar tests were carried out on rectangular blocks 2 x 4 x 9 in., on a bar $2\frac{1}{4}$ in. in diameter and on two bars $1\frac{1}{2}$ in. in diameter. These were quenched and reheated to 650 deg. C., excepting that the $1\frac{1}{2}$ -in. bars were tempered at 600 deg. C. and 630 deg. C. respectively. The results, given in table II, indicate that the double-heat treatment improves large castings in about the same way as it does smaller ones, although the values finally obtained with large castings are not so good as those obtained with small ones.

The resistance of the material to alternating stresses after heat treatment is shown by Fig. 3.

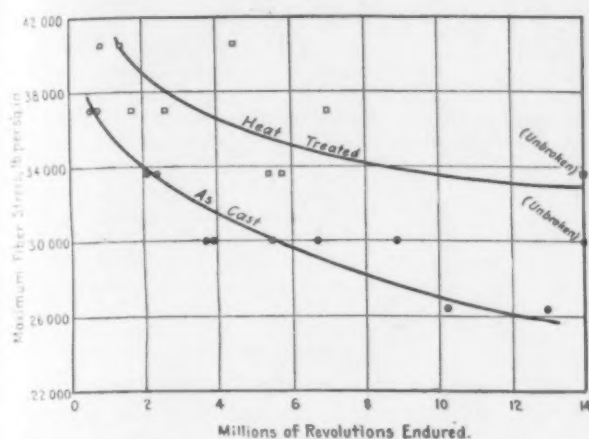


Fig. 3—Stress-Endurance Tests on Aluminum Bronze Specimens Cut from Large Castings after Heat Treatment

Table II—Results of Tests on Specimens of Larger Size Subjected to Double Heat Treatment

Original Size	Temperature of Second Treatment, Deg. C.	Proportional Limit, Lb. Per Sq. In.	Tensile Strength, Lb. Per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent
1½ in. in diameter.	600	53,600	93,300	10.0	13.5
1½ in. in diameter.	630	43,300	88,500	13.0	14.2
1½ in. in diameter.	650	34,600	74,000	14.5	17.6
2 x 4 in. block.....	650	40,800	85,100	12.5	15.7
2 x 4 in. block.....	650	39,700	78,200	9.5	15.0
2 x 4 in. block.....	650	40,200§	74,700	9.0	13.5

§This value is for yield point instead of proportional limit.

New Oliver Heavy-Duty Engine Lathe

A heavy-duty 26-in. engine lathe has been designed by the Oliver Machinery Company, Grand Rapids, Mich. The headstock is heavily ribbed, has a long bearing on the bed and has a front bearing of 6½ in. x 10 in., with a rear bearing 4½ x 7 in. It is of special all-gear design, with a single pulley. There are two speeds from the countershaft, giving a range of 12 spindle speeds from 8 to 300 r.p.m. The tailstock spindle is of steel 4 in. in diameter, and is held by clamps acting on two sides. Four large clamp screws with hardened nuts secure the tailstock in place, and it is moved along the bed by a pinion and crank.

The bed, which may be arranged for a taper attachment, is of box type design, with no overhang on the box column legs. It is of ample depth and width to prevent any spring under the heaviest cuts. The V's are wide and heavy, with a span of 24¼ in. over all, and are reinforced by box-section braces closely spaced. The carriage is heavy and has a length on the shears of 40 in. The bridge is deeply ribbed and massive. The cross and tool post slides have taper gibs adjustable for wear, and all the slides are scraped to a bearing and the carriage is scraped to fit the V-ways of the bed. A novel feature is the 30-deg. angle of presentation of the tool-holder slide, which affords a solid bearing for the tool and renders manipulation easier. The slot in the slide is large and the tool holder is secured by a steel sliding block. Micrometer dials reading to 0.001 in. make the setting and finishing of accurate diameters easy for the operator and a thread dial at the right of the carriage slide is provided.

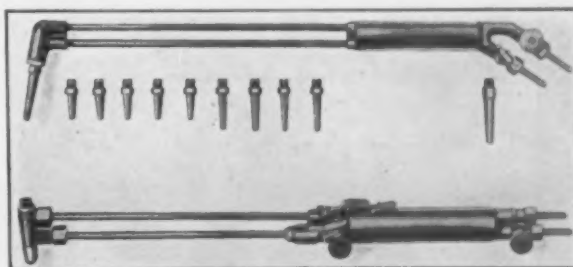
The apron is of the box type with bearings at both ends of each shaft. It has a removable front plate, permitting quick and easy access to the entire internal mechanism without removing the apron from the lathe. Both longitudinal and cross feeds are friction driven and can be engaged by one lever arranged so that both feeds cannot be thrown in at the same time, nor the feed mechanism engaged when the lead screw is in operation. The apron is tongued and grooved to the

carriage, giving perfect alignment. The crank for moving the carriage by hand instead of power, is connected by compound gearing to the rack pinion so as to operate easily, and rapid transverse may be obtained by shifting the crank from the compound to the direct gear shaft. The rack pinion has an extra bearing beyond the rack, a feature not usually incorporated. The feeds and threads are provided by the quick-change gear box, 32 feeds ranging from 0.013 to 0.333 in. per revolution of spindle, and 32 threads ranging from 1 to 24 per inch being secured by changing the lever positions as indicated on the table on the gearbox.

The headstock is designed to permit individual direct or alternating current motors to be used, the driving pulley being removed and a geared connection substituted. A substantial taper attachment, built to become part of the machine, can be supplied. It is secured in place by a wide planed slide on the back of the bed, the holding bolts being locked to a T-slot in the bed. The attachment main casting is scraped to fit this slide, and when locked in place forms the foundation for the taper elements of the mechanism.

Light Welding and Cutting Torches

A new line of oxy-acetylene welding and cutting torches has been placed on the market by Bishop-Babcock-Becker Company, Cleveland, Ohio. The welding torch is provided with two needle valves conveniently placed below the handle for controlling the pressure. The mixing chamber is designed to reduce to a mini-



A New Line of Oxy-Acetylene Welding and Cutting Torches Characterized by Light Yet Strong Construction and Convenient Arrangements for Controlling the Flow of the Gases

mum the danger of back-firing caused by shutting off the flow when the tip is brought in contact with the work. This is accomplished by the arrangement of the mixing chamber, the gases coming into this chamber at the same pressure and at sufficient speed so that they will not have time to become hot, and by having an unusually long tip that makes it difficult for the flame to back-fire. The oxygen has a straight passage from the inlet tube to the tip. The acetylene enters an annular cavity in the mixing head and is fed through small ports into the mixing chamber. The entire torch is made of brass except the extreme end of the tips, which is of copper. It is 24¼ in. long and the handle is 1¼ in. in diameter. It is furnished with seven interchangeable welding tips for various drill sizes.

In the case of the cutting torch the acetylene, controlled by a needle valve, passes through five holes in the tip, these surrounding the oxygen opening. The oxygen is controlled by a thumb valve at the top of the handle with an automatic locking device that is released by a pressure of the thumb. In starting to use the torch the acetylene is turned on with sufficient oxygen to produce combustion. When the metal is sufficiently hot the oxygen is turned on at high pressure in the central jet through the surrounding flame. This torch is made of brass and is 24½ in. long and its handle is 1½ in. in diameter.

The production of bituminous coal and anthracite in the United States in 1915 amounted to 531,619,487 net tons, valued at \$686,691,186, an increase, compared with 1914, of 3.5 per cent, in quantity, and of 0.8 per cent in value, according to C. E. Leshar, of the United States Geological Survey.

FURNACE GAS FOR BOILERS*

The Conditions which Insure Maximum Economy in Its Use

There are four causes for low boiler efficiency in the utilization of blast-furnace gas: 1.—Incomplete combustion. 2.—Combustion with large excess of air. 3.—Water vapor in the gas. 4.—Deficiencies in the boiler plant itself.

LOW COMBUSTION TEMPERATURE

The highest combustion temperature is obtained when the gas is fairly dry and burned without excess of air. For most blast-furnace gas, this temperature is between 2450 deg. and 2500 deg. Fahr. with cold gas, and from 2.8 to 11.8 per cent higher with gas of a temperature of 200 to 600 deg. Fahr. It is an accepted rule that for the same quantity of any given gas passed in

on the combustion temperature. It is based on burning blast-furnace gas with 10 per cent excess of air, the air being at 60 deg. Fahr., and carrying different amounts of water vapor per cubic foot of dry gas measured at 60 deg. Fahr. and atmospheric pressure. This curve will answer questions as to the temperature to which blast furnace gas should be cooled to give the best efficiency. Without exceptionally cold water gas cannot be cooled below 75 deg. Even this temperature will be seldom obtained, as it is usually profitable to use cooling water from the blast furnace for washing purposes, so that the above temperature usually lies between 80 and 100 deg. Fahr. The difference in the combustion temperature will not be greater than about 40 deg. Fahr., or less than 2 per cent. Heat abstracted by water vapor in the waste gas is negligible.

SENSIBLE HEAT

It has been held that cold clean gas is preferable to hot unwashed gas. This does not apply to water-

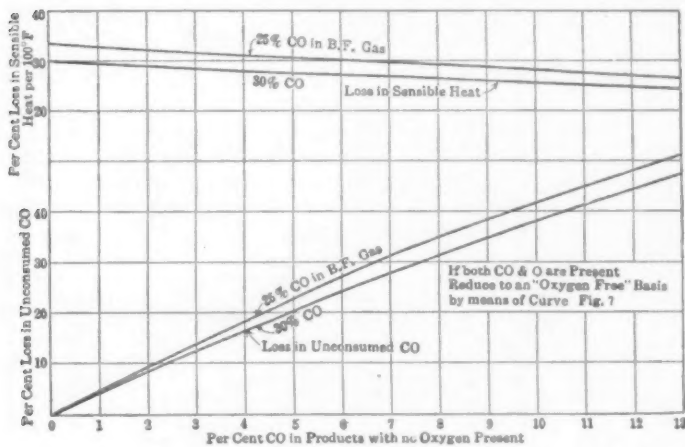


Fig. 1—Losses Due to Incomplete Combustion

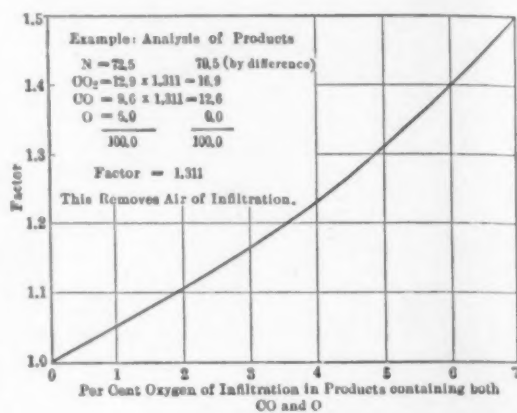


Fig. 2—Factors for Correcting Analyses

a given time, the stack temperatures will be in inverse relation to the combustion temperature. This shows the importance of a low excess of air, as a large excess will not only increase the volume but also the temperature of the waste gas.

Fig. 1 shows the effect of excess air, water vapor and unburned CO on the combustion temperature, and gives the losses of both sensible and latent heat due to incomplete combustion for gases containing 25 to 30 per cent CO with 0 to 13 per cent CO in the waste gas without excess of air. If the analysis of the waste gas shows excess of oxygen despite the unburned CO, both CO₂ and CO must be multiplied by the factor depending on the amount of oxygen in the waste gas. The

tube boilers where the tubes can be cleaned once each turn. Fig. 4 gives the thermal capacity of the various constituents of blast-furnace gas from 60 to 1000 deg. Fahr., and may be used to ascertain the value of the sensible heat in the gas. Hot gas containing, say, 107 B.t.u. both in latent and sensible heat is just as valuable as cold gas of 60 deg. Fahr. containing the same amount of heat in the latent form alone. A boiler efficiency of 75 per cent or higher should be obtained without difficulty with uncleaned gas. This efficiency on hot gas corresponds to an efficiency of 80.5 per cent on cold gas, and unless this latter figure can be exceeded there would be no profit in washing the gas.

Fig. 5 shows losses of sensible heat due to washing,

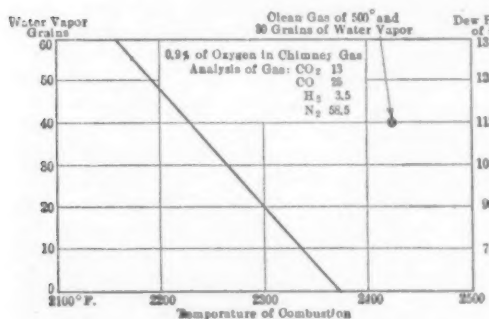


Fig. 3—Temperatures of Combustion of Blast Furnace Gas

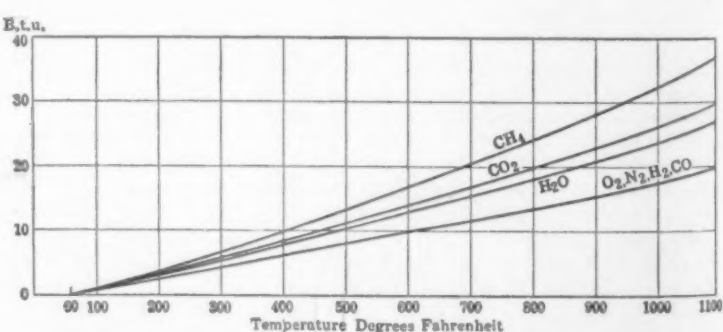


Fig. 4—Thermal Capacity of Gas of Different Temperatures

Gas burned with air at 60 deg. Fahr. and 10 per cent excess air. Gas saturated with varying amounts of water vapor per cubic foot of dry gas measured at 60 deg. Fahr. and atmospheric pressure

value of these factors is given by Fig. 2. The chart is correct for all gases containing 38 per cent CO + CO₂, 3 per cent H₂, and 59 per cent N₂, dew-point being 120 deg. Fahr., and the gas temperature 400 deg.

Fig 3 illustrates the effect of water vapor in the gas

*From a paper presented by K. Huessener before the New York meeting of the American Institute of Mining Engineers.

while Fig. 6 shows the effect on combustion temperature of sensible heat when the gas is burned with excesses of air of 10 to 50 per cent respectively. Fig. 7 shows the percentage losses for each 100 deg. Fahr. rise of temperature over the boiler house temperature, for varying CO, in the waste gas, from furnace gases containing 25 to 30 per cent CO.

BAD BOILER CONDITIONS

Bad boiler conditions and the losses resulting therefrom, are: Defective brickwork, causing air leakages; insubstantial brickwork, causing high radiation and conduction losses; lack of boiler houses with the same results; defective baffles; scale; or too short passages for the products of combustion. The effect of air infiltration is shown by the following figures obtained at Johnstown:

	Gas Pressure, 4.5 In.					Gas Pressure, 3.5 In.	
CO ₂	11.7	13.0	13.3	18.8	19.7	15.0	18.0
Rear temperature, deg. F.	626	620	616	578	577	580	545

Air infiltration here caused loss not only because it all had to be heated to stack temperature, but also because it resulted in an increase of stack temperature, thus reducing the heat absorption capacity of the boiler tubes.

As regards boiler loads, high boiler efficiencies are compatible with overloads of 200 per cent or more. The load depends on the chimney draft, and the limit is not reached until all dampers are wide open and balanced draft is established in the combustion chamber. At this draft the boilers receive all the air and gas which the stack can handle. Further increase of boiler capacity beyond this point may be made by the installation of induced draft. The maximum boiler load is dependent somewhat on the dust in the gas. The limit is reached when it is no longer possible to keep the tubes clean by blowing once every turn. This limit is about 180 per cent of the capacity. This load, however, can be exceeded if the gas is cleaned.

Boiler construction has considerable influence on the economy, even aside from the condition of the boiler setting. While the one-pass boiler is considered almost hopeless from the standpoint of efficiency, nevertheless the author found these boilers could be run on 100 per cent load with an efficiency of 75 per cent. Attempts to overload, however, were futile. The chief disadvantages of the one-pass boilers are the difficulty of keeping them air tight, together with a large radiation and conduction loss in comparison with their capacity. Inasmuch as it is possible to run this type of boiler on gas with high efficiency at its rated load, it will not pay

In order to keep the relation between the gas and aspirated air constant, the pull and velocity of the gas and air mixture by chimney draft must be kept constant, or the quantitative relation between the gas and air will be upset. The importance of draft regulation depends on the variation in the gas pressures. Where these variations are small, the draft regulation is of relatively small importance. It is, however, of great importance where it is desired to burn gas with a low excess of air, for with the dampers in a stationary position any increase in the gas pressure necessarily results in incomplete combustion. It is not safe to raise CO₂ higher than 21 per cent without automatic draft regulation, whereas with such regulation, 24 per cent CO₂ can be safely maintained.

Specifications for Railroad Spring Bars

A specification for carbon-steel bars for railroad springs, with special silicon requirements, has been adopted tentatively by the American Society for Testing Materials. The specification will be published in the forthcoming year book of the Society, and a year hence, at the annual meeting, will come up for consideration. It requires the favorable vote of the annual meeting before a given specification is submitted to the membership for a mail ballot, and then, a majority of the voters approving, the specification becomes one of the standards of the society.

The proposed specification, like the existing A. S. T. M. standard for carbon-steel bars for railroad

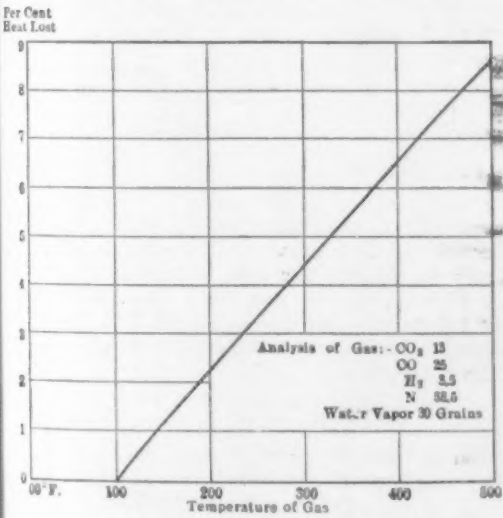


Fig. 5—Losses Due to Washing

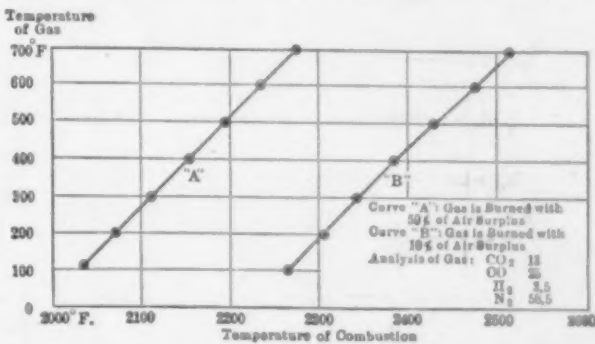


Fig. 6—Combustion Temperature with Varying Amounts of Excess Air

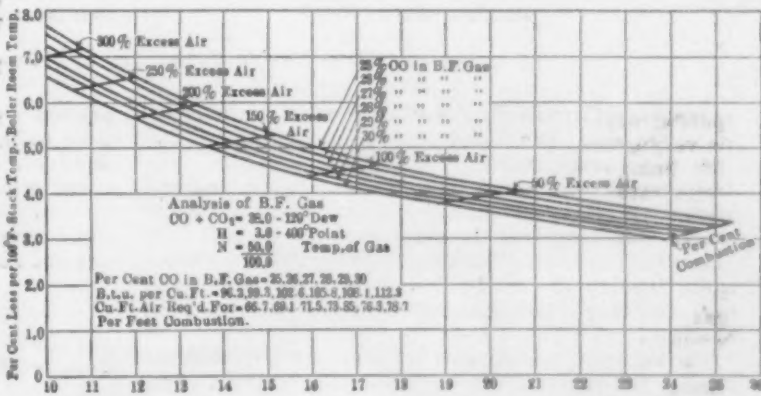


Fig. 7—Percentage Losses of Heat in Stack Gases Based on the CO₂ Content

to install more modern boilers for the purpose of increasing the efficiency, if ample capacity in one-pass boilers is available. Equally good efficiencies can be obtained on all types of boilers, provided the combustion arrangements are carefully designed.

The factor of second importance is that of draft. The statement that a burner of the type which employs a preliminary mixture of gas and air provides its own combustion air independent of the chimney draft is not wholly true. The inspiration of any burner is chiefly dependent on chimney draft and stands in direct relation to the velocity in the mixing chamber.

springs, provides for two classes—class A for elliptical and helical springs, and B for helical springs. The requirements for the chemical composition, covering carbon, manganese, phosphorus and sulphur, are identical with those of the existing standard specification, but there is the addition of the silicon content, which is put at 0.25 to 0.50 per cent for both classes of springs. In the new specification, however, no table of permissible variations is provided for, but, instead, the permissible variations in the width and thickness of the bars is to be agreed upon by the manufacturer and the purchaser.

TESTING FIRE BRICK*

Methods Which Simulate Working Conditions in Iron and Steel Manufacture

BY C. E. NESBIT AND M. L. BELL

The selection of a suitable refractory calls for a study (1) of the temperatures involved, and (2) of the nature of the hot material and resulting slag to which the refractory will be exposed. In the iron and steel industry the more important uses of refractories are (a) in the blast furnace, (b) in the blast furnace stoves, (c) in the open hearth, (d) in soaking pits, heating furnaces, mixers, ladles, etc., where the temperature is lower than in the other furnaces. Two general conclusions have been derived from a review of the use of refractories around iron and steel plants: The life of a furnace is determined by the life of its brickwork and different furnaces demand different physical properties in the brick used.

In the blast furnace the ore, coke and limestone are often fed in wet or frozen. Since the material must

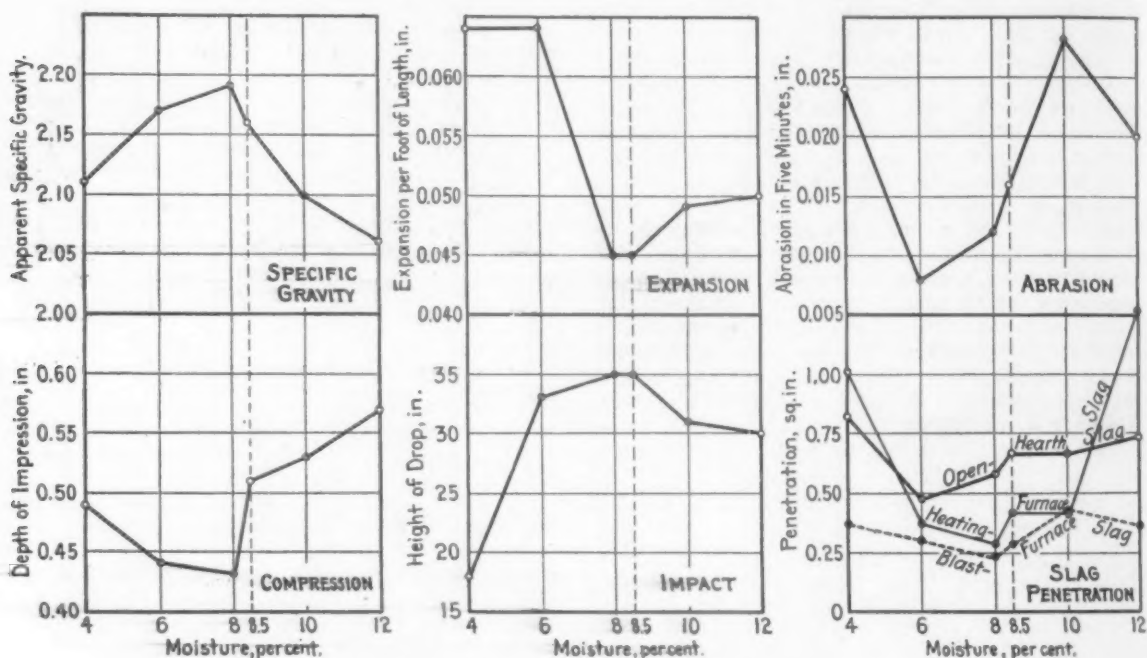
of impact, abrasion and spalling, which would take place in an actual service of several years.

IMPACT TEST

After considering rattler and similar tests it was decided to employ a steel ball $2\frac{1}{2}$ in. diameter, dropped from various heights on the brick heated to the working temperature. Beginning with a drop of 2 in., the ball was dropped from heights progressively increased 2 in. at each drop, upon the end of the brick heated to 260 deg. C. The height to which it was necessary to raise the ball to produce fracture of the brick represented the resistance to impact of the brick. A brick heated to 260 deg. C. and thus tested was 20 per cent weaker than a brick of the same brand tested at 20 deg. C., and 40 per cent weaker when tested at 540 deg. C.

ABRASION TEST

Former abrasion tests have been conducted with the brick cold, by means of an emery wheel. For the tests under consideration a test temperature of 260 deg. C. was adopted for top-wall and pipe brick and of 1350 deg. C. for all others. The heated brick was pressed



Influence of Water Used in Manufacture on Physical Properties of Fire Brick

pass slowly through the furnace the wear on the lining is very heavy. The temperature at the top is low and the lining must withstand principally abrasion. The temperature increases as the fusion zone is reached, where the brickwork must resist heat and slag action rather than abrasion. In the stoves, the brick are required to withstand sudden thermal changes, abrasion, slagging due to the dust carried by the burning gas, and they must also possess good heat absorbing qualities.

In the open hearth silica brick are usually used, although the regenerators are built of fire brick. The silica brick are sensitive to thermal changes, but are highly infusible and will withstand heavy loads, even when heated to a high temperature. Any variation in manufacture of material which will tend to decrease their sensitiveness to heat changes without sacrificing their other good qualities will directly increase the life of the furnace. In heating furnaces, soaking pits, etc., the brick must mainly resist the action of molten metal, iron scale and slag.

In the tests made by the writers the actual conditions of service were limited, so far as possible, rather than laboratory conditions. For instance, in investigating brick for the blast furnace, tests had to be devised which would in a short time reproduce the actions

against a revolving carborundum wheel, pressure and time being constant. The depth of cut was measured when the brick cooled and the result reported as the linear inches abraded in five minutes. The tests developed that bricks are not the same at both ends, there sometimes being 10 to 20 times the abrasion at one end as the other.

SPALLING TESTS

Spalling usually results from thermal changes accompanied by mechanical pinching. In service one end or one side of the brick is exposed to heat action. The test for spalling finally decided upon consisted in placing the brick in the wall of the furnace, exposing only one end and subjecting it to a temperature of 1350 deg. C. for one hour. It was then cooled for 25 min. in an air blast. Thirty alternate heatings and coolings were found necessary to produce a measurable spall and accordingly the brick was cooled in water for three minutes instead. This was a more severe test, cooling in water being found to be three times as effective as cooling in air. The amount of spalling is reported as the percentage loss in weight.

SLAGGING TESTS

Slag tests were made by drilling a cavity in the brick and filling it with slag. Experiments determined the

*Abstract of a paper read at the annual meeting of the American Society for Testing Materials, Atlantic City, June 28.

SPELTER: ITS GRADES AND USES*

The Common Impurities in Their Relation to Various Lines of Service

BY G. C. STONE†

Spelter, like all commercial metal, contains impurities, but, unlike most other metals, none of these impurities are advantageous for any of the purposes for which it is used. The effects of these impurities on different products made from it vary greatly, hence the necessity for several grades differing in purity. Spelter is used for the following purposes, in quantities in the order mentioned: galvanizing, alloys, rolling, ornamental castings and miscellaneous uses.

For ordinary galvanizing the effect of the common impurities is not very great. Iron is objectionable as causing a loss in dross and in making the coating more brittle and liable to crack and peel off. Lead, up to the limit found in commercial spelter, has no serious effect, but is objectionable when present in large quantity, as it liquates in the bath and does not enter the coating and is, therefore, wasted. Lead is usually worth less than zinc and the purchaser does not wish to pay for it at zinc prices.

The four higher grades of spelter are chiefly used for alloys and the specifications were principally made for the alloy makers and do not, in all cases, call for metal suitable for some of the other purposes for which it is used.

ALUMINUM

In alloys, aluminum is frequently very injurious, 0.01 per cent in many cases making brass useless for the purposes for which it is intended. In the few instances where its presence is desired, it is more satisfactory to add it directly than as a constituent of the spelter. The specifications [as proposed for the American Society for Testing Materials in 1915], therefore, require that the four higher grades of spelter shall be entirely free from aluminum.

IRON

Iron is always present in spelter, but is very undesirable in brass and similar alloys, making them harder and greatly increasing the hardness due to cold working. The increased hardness is very objectionable, causing a greater consumption of power and endangering the rolling mills and drawing presses.

LEAD

Lead is very objectionable in some alloys and essential in others, and the main variation in the different grades of spelter is in the allowable amount of lead. High-grade spelter, which is used for alloys that are to be subjected to the most severe spinning and drawing operations, can be rejected if it contains over 0.07 per cent of lead, as lead reduces the ductility of brass.

Intermediate spelter, with a lead limit of 0.20 per cent is used for alloys that do not have to undergo as severe treatment, and also very largely for alloys like manganese bronze that are used both cast and wrought.

Brass special has a lead limit of 0.60 per cent, and is mainly used for brasses where the maximum ductility is not required. The lead and iron are limited to 0.60 per cent and 0.03 per cent respectively, because brass made from such spelter is used for ordinary drawing, spinning and forming work where the requirements are not especially severe.

Selected spelter carrying the maximum 0.80 per cent of lead and 0.04 per cent iron is used by brass manufacturers for making alloys to which lead is added in order to secure free cutting qualities. Material of this kind is usually made into rods and heavy sheets for the manufacturing of small articles by turning, milling and drilling operations. Such brass must contain sufficient lead to reduce the strength of the material and cause the chips to break easily.

*Submitted as an addendum to the report of the Committee on Non-Ferrous Metals and Alloys at the meeting of the American Society for Testing Materials, Atlantic City, N. J.
†Metallurgist New Jersey Zinc Company.

Owing to the fact that brass is usually made in crucibles in small quantities, uniformity in the spelter is of the greatest importance. As lead segregates badly, and more markedly the higher the proportion, the lead limit of the average sample is made low enough to allow for this tendency without injurious effect on the product. Even when the brass manufacturer adds lead, he does so in known amounts and thus obtains a uniform alloy from the different pots, which would not be possible if all the lead needed were contained in the spelter.

CADMIUM

There is very little doubt that cadmium in zinc is very injurious for some of the purposes for which it is used, as it renders it harder and much more brittle. There is, however, considerable difference of opinion as to how far these undesirable properties persist in alloys made from zinc containing cadmium. The majority of the brass makers are of the opinion that the high temperature of the brass pots cause so much of the cadmium to volatilize that the residual amount has very little deleterious effect.

There is no doubt that large amounts of cadmium, say 1 or 2 per cent, make brass hard and brittle. We have no reliable information at present showing the effect of small amounts of cadmium on the alloys, and the evidence on this point is extremely conflicting.

Cadmium, together with lead, seems to intensify the effect of the latter and also causes the brass to become more sensitive to the effect of overheating in the various annealing operations to which the wrought material is subjected.

Very little spelter is made containing as much cadmium as is allowed for intermediate and brass special and the specifications, therefore, put practically no limit on cadmium except for high grade. Whatever the facts may be for alloys, it is certain that the amounts of cadmium allowed by the specifications are much greater than are permissible for other purposes for which zinc is used. The question of cadmium in the better grades is complicated by the fact that until the last year and a half practically all the high-grade and most of the intermediate spelter was made by one company from ores that are free from cadmium. The alloy makers have, therefore, had no extended experience with the effect of cadmium in the better grades of spelter, and during the last eighteen months conditions have been so abnormal that it is difficult to draw conclusions.

High-grade spelter is very extensively used for galvanizing telegraph and telephone wires which are required to stand sharp bending when making the "lineman's splice," as it has been found that if impure spelter is used, the coating cracks and peels off the joint. The only high-grade spelter that has been used for this purpose is entirely free from cadmium. Cadmium being the element most likely to cause this trouble, it is very doubtful whether metal containing as much as is allowed by the specifications (0.05 per cent) would be suitable for this purpose.

For rolling, cadmium causes such severe cracking that metal containing much of it is not economical; but as practically all the zinc rolling mills produce their own spelter, this matter is within their own control and the specifications do not affect them.

For ornamental castings no spelter described by the specifications would be satisfactory. The high-grade is all right as far as lead and iron are concerned, but with the maximum cadmium allowed, it would be impossible to make castings of many of the common shapes.

Marked bars is a term which for some 60 years has been applied to the highest quality iron bars made in South Staffordshire, England. The word marked means branded, and, according to *The Engineer*, originated in the circumstance that each bar turned out in the mill is branded with the maker's "best iron" trademark. It may be a lion rampant or some such emblem. Formerly some nine firms or so made this class of iron, but the number has now decreased to five, and the tendency is for it to get less and less.

New Menace of Higher Manufacturing Costs

Health and Unemployment Insurance for Workmen
Would Strike Hard at Industrial Profits — Much
Greater Burden Than That of Workmen's Compensation

— BY JOHN NELSON —

American industries are facing the possibility, even the probability, of legislation establishing compulsory sickness and unemployment insurance for workmen, which would affect in a really important way the cost of manufacturing. Already in most sections of the country workmen's compensation is a fixed charge. What the proposed benefits would develop into in dollars and cents can only be conjectured. Their advocates do not pretend to have satisfactory figures, for statistics upon which to base them are meager. But the annual cost to the employer might be put at something like the following:

Sickness or health insurance.	\$3 per \$100 of total payroll
Unemployment insurance.....	\$1 per \$100 of payroll
Total.....	\$4 per \$100 of payroll

The basis of these figures is that both classes of insurance are confined to persons earning \$25 a week or less. They are partly guesswork and partly based on estimates made up from the experience of individual establishments. A glance at the benefits provided in bills already presented to legislatures, details of which will be found below, suggests that the figures given are too low rather than too high. One large company, which for a number of years has looked after the health of its employees in an organized way and has complete records, estimates that the cost of sickness insurance as at present planned would be seven times that of workmen's compensation. The burden of the latter system is something around 1 per cent of the payroll.

A LARGE ADDED BURDEN

To add a charge equal to 3 or 4 per cent of the labor cost of a product would be no small factor in most cases.

The State, too, would feel the effects of these new forms of insurance, for it would share the cost with the employer and the employee. It is estimated that the State tax of Massachusetts would be increased 50 per cent by health insurance alone, which on the present levy would add about 50 cents per \$1,000 to the full tax rate.

The answer is that the cost would be borne by the ultimate consumer; that the cost already exists, and its distribution would be better cared for, especially because it would remove the workman further from the atmosphere of charity and pauperism.

Apart from their actual cost, a great objection to these systems of insurance is that they would introduce additional elements into the realm of disputes between employer and employee. The workman's contributions would be subtracted from his pay envelope, and thus would assume a part in the question of amount of wages. Abroad they do it in a different way; the employee pays the state direct; his wages are not tampered with by his employer.

It was hoped, in fact confidently expected, that workmen's compensation would get rid of a large part of the controversies regarding awards of damages for accidents which were common under employers' liability. But such has not been the result. The cases which get into the courts are constantly

increasing in number, and presently may exceed the experience under the old practice. They indicate what might be expected under health or unemployment insurance.

Still later, an old age pension system is likely to be brought forward. This would add something to the burden of costs, but not so much as either of the others. Statistics show that the number of workmen who would be entitled to benefits under old age pensions is relatively small.

AN ORGANIZED MOVEMENT

The movement for sickness and unemployment insurance has been started in an organized way. Among the bills to establish the former is one prepared by the Committee on Social Insurance of the American Association for Labor Legislation, which has been submitted to the legislatures of a number of the States, particularly New York and Massachusetts. The Massachusetts Committee on Unemployment has introduced in the Legislature of that State a bill to establish unemployment insurance.

All of these measures follow the lines of European practice. Both health and unemployment insurance are in successful operation in England and Germany, or were before the war, and the same is true of old age pensions. Industrial systems such as these are brought to us after they have been tried out abroad. A dozen years ago the idea that workmen's compensation would be transplanted here was not considered seriously; yet it is now thriving in this country. Therefore owners of industrial plants will find it well to get acquainted with what they will have to meet. The American employer will have to admit that usually he knows little regarding pending issues of this character, until it is too late for him to apply his experience and knowledge to a just solution of questions involved.

Workmen's compensation has never been considered as an entirely new expense, because it replaced the old employers' liability, the average cost of which was a large percentage of the present charges resulting from accident. But the proposed forms of insurance would be absolutely new costs. One great trouble would be that the increase would not be uniform between the States. It is not difficult to conceive of such legislation increasing to the extent of compelling manufacturers to move their works out of a State, or of causing the shutting down of plants the owners of which have factories in other States where manufacturing could be done more cheaply.

It is argued that Germany and England maintain not only health and unemployment insurance, but old age pensions as well, and have highly developed them without creating too great a burden, the manufacturers sharing the cost with the workmen and the state, and adding it to the price of the product. These two countries are our chief competitors. But labor there is paid much less than in this country. Our competition with European manufacturers here and in foreign markets proves that they are better able to carry such burdens. Most important, too, is the fact that their governments

legislate for the whole country and the burdens fall on all manufacturers.

HEALTH INSURANCE AND WORKMEN'S COMPENSATION

Health or sickness insurance for the United States must be considered in connection with complications that have developed in workmen's compensation. The compensation acts are not satisfactory in their relation to sickness. Some form of health insurance may be desirable on that account. The several causes of incapacity of employees are these:

1. Injury sustained by accident during employment.
2. Sickness arising out of injury, such as septic poisoning.
3. Sickness not resulting from an accident but originating in the employment, as among workers in lead or cyanide.
4. Sickness not originating in the employment, but aggravated or accelerated by it, the worker bringing the hazard to the employment, as in the case of a weakened heart or a predisposition to tuberculosis.
5. Sickness and accident having nothing to do with the employment.

The first two classes come under compensation everywhere. Most employers agree that the third class should be cared for; that occupational disease entails upon them some degree of financial responsibility. But they hold that the compensation statutes should sharply define this liability.

As to the fourth class, which in some States has been held to come under compensation, owners are unwilling to acknowledge that they should be held liable in these cases in the same manner as where an employee had suffered in an accident. If a workman has a weakness, some obligation rests with him to discover it and to select his employment accordingly. At most, the responsibility should be divided between him and his employer, it is argued. The exponents of compulsory health insurance believe their system would solve all such differences. The benefits of compensation might be confined to accidents and their direct results and perhaps occupational diseases. Health insurance would care for everything else.

Compulsory Health Insurance

The bill of the committee on Social Insurance of the America Association for Labor Legislation provides for compulsory health insurance for every person employed at manual labor under any form of wage contract, and for every other employee whose remuneration does not exceed \$100 a month. The insured and his dependents would receive benefits in case of any sickness or accident, or for death, not covered by workmen's compensation, as follows:

A cash benefit, beginning with the fourth day of disability on account of sickness, equal to two-thirds of the weekly wages of the insured member. It would be paid only during the continuance of disability, and not to the same person for a period longer than thirteen weeks in any one case, and not over twenty-six weeks in any consecutive twelve months.

A cash benefit equal to one-third of the wages of an insured member receiving hospital treatment, to be paid to his family or other dependents while he is in the hospital, during which period he relinquishes all other benefits.

Medical, surgical and nursing attendance during the continuance of the sickness, not to exceed twenty-six weeks from the first day, and if not paid by the owner, cash for the cost of such service not to exceed one-half the weekly cash benefit. Or treatment in a hospital might be substituted in case of contagious disease or for other good reason.

Medicines and supplies, such as crutches, trusses and eyeglasses, not to exceed in cost \$50 in any year.

Medical and surgical treatment for dependent members of the family of the insured.

Maternity benefits, consisting of all necessary medical and surgical aid, materials and appliances, which would be given insured women and the wives or widows of insured men. Also for insured women a weekly cash benefit equivalent to the regular sick benefit of the insured, for a period of eight weeks.

Funeral benefits to the amount of \$50, which would apply

also where death ensues within six months after discontinuance of sick benefits because of the exhaustion of the time limit, provided that the workman had not within six months returned to work.

COST OF HEALTH INSURANCE

It is proposed that the State contribute one-fifth of the total expenditures for benefits, the employer one-half of the balance and the employee one-half, except that if the earnings of the insured fall below \$9 a week, the shares of the employer and employee shall be in proportion to their joint contribution as indicated in the following schedule:

If Earnings Are Under	But Not Under	Employer	Employee
\$9	\$8	60 per cent	40 per cent
8	7	70 per cent	30 per cent
7	6	80 per cent	20 per cent
6	5	90 per cent	10 per cent
5	..	100 per cent	0 per cent

Just how this apportionment would work out as a total no one knows. A great many employees earn less than \$9 a week. Taking these into account one estimate makes it that the State would pay 4/20, the employee 7/20 and the employer 9/20.

The cost of this insurance cannot be based on actuarial experience. The advocates of the bill state:

Investigations for the United States Bureau of Labor Statistics and for private institutions agree that at least 4 per cent of the income of working class families goes for care of sickness and for burial expenses. Based on German experience this would be about the percentage of wages required for all the benefits in this draft.

This estimate cannot take into full account the cash benefits. The workman and his family would receive a very large part of what he had been paying for without help from anyone in the "care of sickness and in burial expenses," excepting burial expenses for dependents, and in addition he would be given a cash income while he was laid up. Also the important correction must be made that the outlay from the insurance fund would be a constant one. When people were out of work they would still be entitled to the insurance for which they had paid. And the income would decrease automatically with a falling off of employment. Therefore, contributions would have to be large enough in prosperous periods to pay benefits than in dull times also.

However, the law would exclude those employees receiving more than \$25; and for the sake of estimate this may be presumed to offset these other charges which would bring the cost above the 4 per cent.

COST OF ADMINISTRATION

But it would not offset the very large addition that would have to be made to the 4 per cent, or whatever it might be, to take care of the cost of administration, always an important factor in such systems. It is known that about 37 per cent of the total cost of workmen's compensation is apart from the money paid employees. The cost of administering health insurance would be greater than that for compensation, since the benefits would be much more broadly distributed. Assuming 40 per cent to be a fair approximation, would mean that the \$4 per \$100 of the payroll represented in cash expenditures of one form or another would be 60 per cent of the total outlay. Thus the latter figure would be more than \$6.50 per \$100 of total payroll. Under the division already indicated, the State would pay \$1.30 per \$100 of payroll, the employee \$2.275 and the employer \$2.925.

Against his share the employer could charge the expenditures he is now making voluntarily in looking after his employees when they are in need of assistance.

THE EMPLOYER'S PART

The reasons for the employer's large share in financing sick benefits are thus given by the advocates of the plan:

The share of industry in causing sickness is well recognized. Not only the more clearly defined industrial diseases like lead poisoning and caisson sickness, but tuberculosis, anaemia, digestive and nervous disorders are partly or wholly caused by dust, speeding up, monotony, long hours and other conditions associated with modern business. Aside, therefore, from the advantage of interesting the employer financially in decreasing sickness by improving working and living conditions, and from his gain by a healthier working force, there is ample justification for requiring industry as such to contribute to the insurance.

The establishment of this system would give a great boost to the practice of compulsory physical examination. Probably, also, hygienic conditions would prevail more generally, though the advance in this respect is so constant that in most cases no unusual stimulus would be needed.

The bill contains various other provisions than those cited above. One is that the commission shall, if petitioned to do so, assess upon any employer, any of whose employees are insured in labor union or benevolent societies, a sum equivalent to the employer's contributions had such employees been insured under the general provisions of the act.

Insurance rates for different industries might vary with the sickness ratio in each, and the commission would have the power to go a step further and increase the contributions paid by the employer in particular establishments which show a higher sickness rate than others in the same industry.

Unemployment Insurance

The measure submitted by the Massachusetts Committee on Unemployment to the Legislature of that State is entitled "a bill to provide insurance for workmen in certain industries who are temporarily unemployed." These industries are essentially the same as those having workmen's compensation. The application would be to all men and women over 18 years of age engaged in employment, manual or otherwise, excepting clerks, at a wage of \$25 a week or less. The law would be compulsory.

The benefits for the unemployed would be paid from a fund administered by an "unemployment insurance commission" and contributed to by employee, employer and the State in equal share. The bill divides the employees into three groups. The first, earning \$8 a week or less, would receive \$3.50 weekly; the second, earning \$12 a week or less, \$5.25, and the third, earning \$12 or more, \$7. Benefits would not be paid an employee for more than ten weeks in one year.

ESTIMATED COST

In the beginning the amount of contributions would have to be fixed by guess. Doubtless it would be placed too high, in order that the fund would surely be large enough to meet any unusual demand that might be made upon it. In the event of an industrial crisis what would happen? Men and women by the thousands would be thrown out of work, and the greater portion of them would be entitled to the benefits for ten weeks. Out of approximately 700,000 people employed in the manufacturing industries of Massachusetts, it might happen that 100,000 of the insured would become enforced idlers all within a few weeks. At an average benefit of \$4.50 a week for 10 weeks \$4,500,000 would be required—rather a tidy sum for an insurance fund to meet all of a sudden. In a period of really dull times a very much larger proportion of

the employees would draw the full benefit, or a part of it, some time or other before twelve months was up. In a moderately poor year great sums would have to be expended in this form of compensation, and even in flush years there would be a steady paying out.

As neither the State, the employer nor the employee would be contributing when the last-named is out of work, the income would decrease or increase automatically as times were bad or good. When income was at its highest point expenditures for benefits would be at their lowest, and vice versa.

The amount of the contributions resolves itself into the average percentage of the insured who would receive unemployment benefits. Taking as a basis the \$350,000,000 annual payroll of Massachusetts manufacturing industry and 700,000 employees (these figures do not pretend to be more than roughly accurate), and presuming that one-fifth of the people receive in the course of a year the full compensation at an average of \$4.50 a week, the money expended for actual benefits would be \$6,300,000. If this is 60 per cent of the total cost, administration consuming the other 40 per cent, the grand total would be \$10,500,000. This is 3 1/3 per cent of the total payroll, making the employer's share of contributions more than \$1 per \$100 of his payroll.

The average of unemployment might be more or it might be less than one-fifth. There is no way of getting at the truth.

Into this question enters the proved fact that in maintaining an industrial force the number of men hired annually is three or four times the average number on the payroll. In a period of prosperity such as the present the transients are more numerous than when things are dull. How many of these transients would receive benefits under unemployment insurance between jobs?

COST OF HIRING AND "FIRING"

Unemployment has one meaning to employers which few of them understand, though it has been pointed out to them from time to time, in that to lay off a man when there is no work for him to do and by so doing to lose his services permanently is to incur an expense which is reckoned at from \$25 to \$40, taking the experience of various American companies which have caused the matter to be investigated. To break in a new man means a loss because he cannot reach the efficiency of his predecessor until he becomes experienced in the work, and oftentimes several men have to be tried before the position is permanently filled and the job is running smoothly again. Work has been spoiled probably and production has been lowered. A manufacturer might carry a fund as insurance against such unemployment, but it is doubtful if the compulsory insurance system would assist much in reducing the evil.

RESTRICTIONS ON UNEMPLOYMENT PAYMENTS

The various restrictions on the operation of the proposed law are interesting and some of them very important. In granting unemployment benefits, among the requirements are the following:

That the workman must have paid at least 26 weekly contributions; but if he has paid less he would be given a proportionate award.

That since the date of his last application for benefits he has been continuously unemployed.

That he is capable of work, but has been unable to obtain suitable employment. [The words "suitable employment" should be noted well.]

A workman is not deemed to have failed to fulfill

(Continued on page 115)

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Easing the Strain in Steel

The fact that the Steel Corporation's unfilled orders fell off nearly 300,000 tons in June is variously commented on in financial columns. When it is pointed out that producers are glad of a change from the steady mounting of contract obligations, we are told that new orders and not those of the past are what the public, meaning probably the speculative public, wants to see. But Wall Street has always given the Steel Corporation's statement of orders an exaggerated significance. With a total of 9,600,000 tons of orders ahead and 60 per cent of these in the form of specifications, the corporation now makes a showing that is without precedent in other years, in the tonnage of firm orders on its books. Yet the fact that shipments in June were more than new orders is given an untoward significance. It seems to be overlooked, in such views, that those who have bought for months ahead, under unusual incitements, cannot keep on buying indefinitely.

The speculative community does not take into account the conditions under which orders accumulated so rapidly in the early months of the year. Fear that they would not be able to get material when wanted was the compelling influence with many buyers in those months. Many of them were buying speculatively against further advances. As time went on and it began to appear that in general prices had reached the high point, eagerness to buy for far-off delivery diminished and consumers of steel began to lose their fear of a steel famine. To-day there is no longer competitive buying, stimulated by the fear that consumers' plants might have to close down for lack of material. The present situation, in which buyers are able to look forward calmly to a market no higher than to-day's, with the expectation that increasing capacity will reduce the congestion at the mills and thus cut down premiums on prompt material, is much healthier than that which prevailed at the beginning of the year. Then, too, the unparalleled prices for steel have at length had some of the predicted effect upon domestic consumers. The process of readjustment is not likely to be rapid, but it will only be following precedent if at length it brings users of steel into closer step with the operations of the mills and reduces the amount of speculative buying for the distant future.

Our Half-Yearly Index

The Index of THE IRON AGE for the past half year, January to June, inclusive, has been compiled and printed and is now ready for distribution. It will be forwarded promptly to those who have entered their names on our list as desiring it. Others who may have use for copies will be furnished them by addressing our Circulation Department.

A Million Tons Extra Scrap

The condition of the United States producing a larger tonnage of steel ingots and castings than of pig iron was accentuated in 1915. Last year's statistics are naturally compared with those of 1913, as the outputs in the two years were not greatly dissimilar, while 1914 was very decidedly an "off" year. The production of pig iron decreased from 30,966,152 tons in 1913 to 29,916,213 tons in 1915, while the production of steel ingots and castings increased from 31,300,874 tons to 32,151,036 tons. In 1913 steel exceeded pig iron by 334,722 tons and in 1915 by no less than 2,234,823 tons.

Only a very small part of this change of alignment was due to the production of steel-making iron decreasing less than the production of foundry grades. It will be understood that long-range comparisons like these are purely statistical. What occurs is that in the steel mill and steel foundry large quantities of scrap are used, the major portion of the scrap arising in the works itself, and the use of this scrap fully offset in 1913, and much more than offset in 1915, the pig iron that does not reach the steel mill or steel foundry being used in the iron foundry and, to a limited extent, in the puddling furnace. Another factor is the steel-making pig iron that may accumulate in one year or be drawn from stocks in another.

The useful comparison is that between the output of steel-making pig iron and the output of steel ingots and castings. As nearly all the Bessemer pig iron produced passes to the acid open-hearth steel works and the Bessemer steel works, the production of ingots and castings by the two acid processes may be compared with the production of Bessemer and low-phosphorus pig iron, the proportions of steel to pig iron being 93.19 per cent in 1913 and 91.77 per cent in 1915, showing that last year's larger production of steel as compared with pig iron was not due to what occurred in connection

with the acid open-hearth or Bessemer steel-making processes, but rather in despite of what occurred. In this slight change in relations there is the suggestion that probably stocks of pig iron were not drawn upon in 1915 any more than in 1913, if they were in that year. If that is true with Bessemer iron it is perhaps true of basic also, for the one grade would be stocked about the same as the other.

Making for basic iron a comparison similar to the foregoing, it is found that in 1913 the production of basic open-hearth steel ingots and castings was 162.3 per cent of the production of basic pig iron, while in 1915 the proportion was 170.4 per cent, showing a large increase. Dividing in reverse manner, the basic pig iron was 61.63 per cent of the basic steel in 1913 and 58.69 per cent in 1915. Evidently more scrap was used in 1915, and one naturally infers that the larger supply was due chiefly to greater production of works scrap on account of there being a large output of war steel, involving much more than the normal cropping.

Comparing the figures in another way, if the proportions between basic pig and basic steel that obtained in 1913 had obtained in 1915 the production of basic steel would have been 1,100,000 tons less than it was. Possibly that figure is suggestive of the extra amount of scrap used last year.

There is a means of checking the inference just drawn, that an unusually large proportion of scrap passed into steel ingots last year. The production of finished rolled steel can be compared with the production of steel ingots. The percentages of merchantable rolled steel to ingots have been as follows in the past five years:

	Per cent
1911.....	76.33
1912.....	76.01
1913.....	76.33
1914.....	75.38
1915.....	73.83

The drop in 1915 is decidedly marked, considering how slightly the percentages fluctuated in the four years preceding. Taking 76 per cent as the normal proportion, the 23,098,091 tons of rolled steel in 1915 would have required 30,390,000 tons of ingots instead of the 31,284,212 tons actually produced, the divergence being 900,000 tons. Thus, comparing basic pig iron with basic steel, 1915 showed a divergence of 1,100,000 tons, while comparing ingots and rolled steel a divergence of 900,000 tons is indicated, and in the absence of further information one may regard it as strongly suggested that the production of heavily cropped shell steel in 1915 resulted in the production—and use—of about a million tons more scrap than the normal.

Prospects of Car Buying

There is some speculation as to whether the railroads will place additional car orders of any magnitude while steel prices remain at their present level. The fact that car buying seems to have almost ceased is not in itself conclusive proof that it will not be renewed without a change in steel prices. As a rule cars are scarcest late in the year, when the crops are to be moved, and deliveries are desired before that period. When the time comes that such

deliveries could not be expected the railroads naturally have a breathing spell. The recent curtailment in car buying was not due exclusively to the high cost of steel. Car equipment commanded high prices and deliveries were difficult to arrange. Car shops were quoting prices that represented a very fair margin of profit. When the present car orders are largely completed, and reports indicate that such a time will be reached in the not distant future, it may be assumed that the margin of profit demanded by car shops will be materially reduced and that car equipment can be purchased for earlier deliveries and at more moderate prices. All the deterrent influences except the prices of iron and steel would then be removed and it is by no means a foregone conclusion that the railroads would not begin placing car orders again in considerable volume.

An analysis of recent car buying indicates that the cars ordered during the period of particularly high prices have represented special needs in very large part, rather than an effort to increase the general carrying capacity of the road placing the order. Excluding export orders, the distribution as to type of cars ordered since April 1 has been about as follows:

	Per Cent		Per Cent
Box	67	Flat	1
Gondola	19	Work	1
Automobile	3	Coal	1
Hopper	3	Miscellaneous	1
Tank	2		
Stock	2		100

A glance at the table shows that the distribution is altogether removed from the normal. For two-thirds the orders to be in box cars is altogether out of line, while for automobile and hopper cars to be ordered in the same proportion is quite inconsistent with the usual distribution, and it is quite abnormal for twice as many stock cars as coal cars to be ordered. It is evident that the railroads have simply been engaged in rounding out their equipment, and they may be forced to continue this process, even at high prices, though, of course, the total orders would not be large.

There has been some addition recently to the discussion as to the life of steel cars. As summarized in THE IRON AGE of June 22, page 1511, estimates range from 16 to 30 years and even the higher estimate falls quite short of the early expectations. If a trustworthy estimate could be secured, however, it would still be of little use to apply it to the total number of cars in service, to determine the number that would have to be bought from year to year to maintain the equipment, for the reason that experience with steel cars is confined practically to hopper and gondola cars, which suffer harder usage than ordinary box cars and various special types. The last Interstate Commerce Commission report shows 2,356,338 cars in freight service and 95,934 cars in company service on June 30, 1915, and an estimate some time ago placed the number of private freight cars at about 140,000, making a total of about 2,600,000 cars, to replace which in an average period of 16 years would require 165,000 cars a year, while 87,000 cars a year would be required to replace them in 30 years. In this connection it is to be noted that only about one-half the cars in service are of all-steel or steel underframe

construction, and the remaining wooden cars will necessarily be wearing out rapidly in the next few years.

A few years ago the railroads became more deeply concerned over the matter of securing better mileage from their freight cars, the average travel per day being about 21 miles, two-thirds of the mileage being loaded and one-third empty. Despite serious efforts made to improve conditions the average travel per day has been increased only 10 or 15 per cent, and the record suggests that no very great improvement in this respect can be expected. Naturally it is much better to increase the service of the cars than to increase their number, for there is not only the added investment in cars, but also the additional track room occupied. More recently attention has been directed more strongly to the light loading of cars, the average load having increased much less than has the average car capacity. Indeed, the service performed by cars seems ridiculously small. In the past two years the freight ton-mileage has averaged about 283,000,000,000, while the aggregate capacity of the freight cars is about 100,000,000 tons. Thus, if the cars were loaded to capacity they would need to travel less than eight miles per day in order to do their work, or 55 miles per week. If the life of cars is to be less than was expected, however, there is less incentive to make them do more mileage, as their life would thereby be shortened. Having made but little progress toward heavier loading of cars and greater mileage, the railroads may conclude to adopt a freer policy in future in the matter of adding to the number of their cars.

Coming back to the subject of costs, it is to be observed that the average price of pig iron in the various markets to-day is only about \$2.50 per gross ton higher than the average of the past ten years, while plates and shapes are \$25 a net ton above the average. Thus in a car weighing, say, 20 net tons, the cost of the fundamental raw materials does not bear so heavily upon the total cost. If the other service rendered in building and equipping the car is priced moderately the finished car need not cost the railroad a prohibitive figure.

Women in War Industries

To have predicted, early in the war, that woman would have achieved the important position in industry which she holds to-day in the belligerent countries would have stamped one as a bold if not a visionary prophet. But the war has dealt many blows to the old order. To-day 300,000 women are vital factors in the British metal-working industries which have to do with munitions alone, and where 184,000 were employed in war industries in 1914 now 666,000 women are toiling daily. That some hundreds of women are now employed in British shipyards is the latest and most striking development in this unusual movement. In France the necessity for women's aid in producing war supplies is freely acknowledged, and in Germany, it is understood, much the same condition obtains. In one German locomotive plant 1600 women are doing efficient work. As the war continues there may be even more unlikely extensions of woman's work.

A labor union president in a recent address to

the Workers' Union Conference at Birmingham, England, warned those who are jealous of women that to oppose them as workmates is hopeless. He said:

While the old-type trade unionists may swear by his traditions, the new trade unionist, whose ideals of life are beyond this stage, must put aside fetish and superstition. The part that woman is going to play is not one that will have evil results, but a part that will teach her responsibility and give her confidence. Woman is bringing revolution into the industrial world. She is going to be responsible for an amazing increase in the powers of production and she is going to be on our side.

In his presidential address before the Iron and Steel Institute Sir William Beardmore gave a more concrete expression to the issue that has been raised by the unexpected performance of women workers in shell manufacture. Girls employed in projectile factories turned out twice as much work as thoroughly trained mechanics. That demonstration of the throttling of industry by British unionism, in the country's gravest extremity, can never be forgotten, and it will figure largely in the reconstructive work that will follow peace. Labor leaders will reckon without their host if they count on this new-found power of women workers being exerted in behalf of their backward-looking limitations. Germany, when eventually she takes up the work of restoring her highly efficient industrial machinery, may decree the retirement of her war-time women workers in favor of men; but in England the industrial revolution due to women has gone too far for a return to the old status. There may be a large element of patriotism in what girls and women have done for the British munitions output; but with all allowance for that, we cannot doubt that women, having developed an earning capacity of which they had not dreamed, will not be satisfied to resume their old status. The need of their undivided labors in keeping guns fed with steel will pass, but many of them will certainly find other work once thought out of their field. If Great Britain is to have an industrial regeneration as one of the fruits of the war, women will have had a large share in bringing it about.

Lessened Imports of Iron Ore

Iron-ore imports for 1916 are at the rate of 88,313 gross tons per month, or 1,059,756 tons for the year as judged by those for the first four months of this year. The following table from Government data shows these imports in gross tons:

	Per Month
January, 1916	89,844
February, 1916	93,315
March, 1916	94,383
April, 1916	75,712
10 months ended April 30, 1916.....	1,142,964
10 months ended April 30, 1915.....	975,565
10 months ended April 30, 1914.....	1,853,356
	114,296
	97,556
	185,335

For the 10 months to April 30, 1916, the imports are 167,399 tons in excess of those for the same period a year ago. In 1915 the total imports were 1,341,281 tons, or 111,773 tons per month. Of the receipts for the 10 months to May 1, this year, 63,610 tons came from Spain, 181,539 tons from Sweden, 84,343 tons from Canada, 685,399 tons from Cuba and 128,073 tons from other countries.

The Autocar Company, Ardmore, Pa., builder of motor vehicles, has increased its paid-in capital from \$1,500,000 to \$1,800,000. The company is to make large additions to its plant.

Iron and Steel Exports in May, 540,000 Tons

Fabulous Figures Reached in Foreign Trade—Machine Tools Show 50 Per Cent Increase Over April—Bars and Billets Lead

WASHINGTON, D. C., July 11, 1916.—All records were swept away by the phenomenal exports of iron and steel commodities in May, 1916, according to the official statistics compiled by the Bureau of Foreign and Domestic Commerce. Huge gains were made in total exports by values, in shipments of tonnage commodities, and in machinery and machine tools. Not

100 per cent as compared with May, 1915, and 25 per cent over those of April of this year, when high-water mark was reached.

Exports of machine tools took a giant stride in May, gaining 167 per cent over the same month a year ago, and no less than 50 per cent over April last, when all previous totals were beaten.

Exports of Iron and Steel in May, 1915 and 1916, and for Eleven-Month Periods

	May		Eleven Months	
	1915, Gross Tons	1916, Gross Tons	1915, Gross Tons	1916, Gross Tons
Pig iron	18,581	28,293	108,483	237,629
Scrap	1,050	24,889	22,550	138,842
Bar iron	2,394	7,364	10,072	64,463
Wire rods	11,236	15,684	80,303	153,483
Steel bars	37,260	77,669	176,375	564,121
Billets, ingots and blooms, n.e.s.	48,391	142,782	171,417	845,803
Bolts and nuts	1,272	2,494	12,019	28,688
Hoops and bands	1,578	3,280	13,088	37,249
Horseshoes	865	1,051	10,061	11,757
Cut nails	376	614	2,227	4,048
Railroad spikes	264	1,959	4,883	24,306
Wire nails	6,459	12,205	45,291	111,575
All other nails including tacks	726	745	4,189	8,567
Cast-iron pipes and fittings	6,393	4,609	57,334	46,738
Wrought pipes and fittings	15,787	12,400	102,631	113,466
Radiators and cast-iron house heating boilers ..	144	198	2,463	2,070
Steel rails	16,646	48,841	122,040	492,038
Galvanized iron sheets and plates	6,446	7,536	45,042	69,496
All other iron sheets and plates	1,348	5,239	8,286	38,583
Steel plates	16,333	22,679	102,081	252,618
Steel sheets	10,122	9,675	87,344	88,487
Structural iron and steel	14,072	22,938	145,812	251,832
Tin and terne plates	7,307	25,585	72,428	200,722
Barb wire	19,521	39,197	124,804	326,745
All other wire	19,165	22,665	119,047	221,185
Total	263,736	540,591	1,650,270	4,334,511

only did the totals for the month in all these classes far surpass those of May, 1915, but the banner months of the entire fiscal year 1916 were beaten by large margins.

The total shipments of iron and steel products on a basis of value during May gained 179 per cent over the same month of 1915, and no less than 24 per cent over the record total of April, 1913. Tonnage commodities in May gained 100 per cent over the same month a year ago, and 23 per cent over the unprecedented total of March, 1916. Exports of machinery rose

For the eleven months ended May the total exports of iron and steel products on a basis of value rose 180 per cent over the same period of 1915, and nearly 100 per cent over the high record of 1913. Tonnage commodities for the eleven months of 1916 exceeded by 167 per cent the figures for 1915, and by 126 per cent the record total for this period in 1914. Shipments of machinery rose nearly 100 per cent over 1915, and 35 per cent over the high-water mark in 1913. Exports of machine tools for the eleven months of 1916 surpassed by more than 100 per cent the record for the corre-

Exports of Machinery in May, 1915 and 1916, and for Eleven-Month Periods

	May		Eleven Months	
	1915	1916	1915	1916
Adding machines	\$44,947	\$138,116	\$424,316	\$956,327
Air-compressing machinery	34,186	52,159	342,774	490,042
Brewers' machinery	3,716	7,674	102,777	28,620
Cash registers	100,747	155,861	1,232,798	1,314,674
Parts of	11,698	6,167	101,773	108,768
Cotton gins	6,431	2,059	41,436	61,845
Cream separators	33,533	49,126	189,344	456,348
Elevators and elevator machinery	66,696	121,358	752,467	1,367,357
Electric locomotives	4,164	14,523	253,260	436,863
Gas engines, stationary	20,713	40,798	391,508	331,085
Gasoline engines	393,079	1,466,457	3,932,045	9,731,480
Steam engines	413,952	500,322	2,570,790	13,265,351
All other engines	68,824	590,114	726,998	2,788,230
Parts of	366,867	877,648	2,574,005	6,407,301
Laundry machinery, power	25,537	29,028	257,338	259,948
All other	12,079	14,901	196,660	239,263
Lawn mowers	21,019	21,678	264,137	174,917
Metal-working machinery (including metal-working tools) ..	3,762,567	9,935,806	24,427,466	52,849,047
Meters, gas and water	24,514	38,636	279,424	258,454
Milling machinery, flour and grist	273,905	377,523	279,424	2,425,815
Mining machinery, oil well	25,463	275,561	1,786,993	1,183,790
All other	384,684	475,373	3,955,154	5,722,740
Paper-mill machinery	69,703	57,632	676,714	821,633
Printing presses	105,302	200,024	1,257,481	1,441,043
Pumps and pumping machinery	241,224	611,438	2,250,008	4,224,081
Refrigerating and ice-making machinery	65,021	97,796	567,744	655,327
Sewing machines	569,863	534,430	5,659,396	4,995,701
Shoe machinery	126,574	66,648	1,117,332	1,182,508
Sugar-mill machinery	138,084	137,902	1,922,278	5,589,716
Textile machinery	164,376	234,759	1,407,364	2,336,151
Typesetting machines	12,093	218,668	642,790	806,307
Typewriting machines	538,451	968,417	4,521,364	7,990,138
Windmills	81,520	86,967	646,805	982,076
Wood-working machinery, saw mill	83,634	34,340	286,546	328,553
All other	81,804	73,723	608,274	1,020,196
All other machinery, and parts of	1,827,092	3,471,329	15,954,923	28,902,221
Total	\$10,214,062	\$21,984,961	\$83,596,713	\$162,125,926

sponding period of 1915, which in turn exceeded by an equal percentage any previous eleven months.

GREAT LEAP IN STEEL EXPORTS

The value of all shipments of iron and steel products in May, 1916, was \$72,918,913, as compared with \$26,536,612 for the same month of 1915; while for the eleven months the total was \$545,418,533, as compared with \$194,131,255 for the same period of 1915 and \$279,377,451 in 1913, the record total for the first eleven months of the fiscal year.

The exports of iron and steel, for which quantities are given, aggregate 540,591 gross tons in May, 1916, as compared with 263,736 tons for the same month of 1915, and 138,565 tons in May, 1914. The record for such exports was made in March, 1916, with a total of 438,150 tons. The total for the eleven months ended May was 4,334,511 gross tons, as compared with 1,650,270 tons for the same period of 1915 and 1,939,300 tons for the eleven months of 1914.

The first table shows the exports of tonnage iron and steel in May and for the eleven months ended May, 1916, as compared with 1915.

METAL-WORKING MACHINERY 50 PER CENT MORE THAN IN APRIL

Exports of machinery in May, 1916, were valued at \$21,984,961, as compared with \$10,214,062 for the same month of 1915, and \$9,780,752 in May, 1914. Shipments of metal-working machinery aggregated no less than \$9,935,806, as compared with \$3,762,567 for the same month a year ago, and \$6,552,397, the high record of April of the present year. Exports of machinery of all kinds for the eleven months ended May, 1916, were valued at \$162,135,926, as against \$83,596,713 for the corresponding period of 1915.

Details of the exports of machinery for May, 1915 and 1916, and for the two eleven-months' periods are given in the preceding table.

IMPORTS OF IRON AND STEEL

Imports of tonnage iron and steel in May amounted to 32,113 gross tons, as compared with 28,917 tons in the same month of 1915. These imports have risen steadily of late, but are still below the record month's total in the current fiscal year. Imports for the eleven months ended May, 1916, were 362,265 gross tons, as against 218,413 tons for the same period of 1915.

The following table shows the imports of tonnage commodities for May and for the eleven months ended May, 1916, as compared with 1915.

Imports of Iron and Steel in May, 1915 and 1916, and for Eleven-Month Periods

	May		Eleven Months	
	1915 Gross Tons	1916 Gross Tons	1915 Gross Tons	1916 Gross Tons
Ferrosilicon	593	417	6,222	4,933
All other pig iron	10,816	9,650	93,860	99,358
Scrap	2,221	6,407	29,834	92,115
Bar iron	233	909	9,620	86,646
Structural iron and steel	19	67	5,525	1,305
Hoop or band iron .....	.....	.....	648	470
Ingots, blooms and steel billets	813	.....	22,060	.....
Steel billets without alloys	195	2,624	1,767	11,071
All other steel billets .....	.....	2,219	.....	10,678
Steel rails	13,434	9,196	38,046	49,233
Sheets and plates	82	151	2,463	1,618
Tin and terne plates	24	39	4,676	712
Wire rods	487	434	4,340	4,126
Total	28,917	32,113	218,413	362,265

Reports received from the leading ports record heavy shipments during June, but while there is no apparent decrease in the output of iron and steel for foreign account, no prediction can be made as to the total exports of the month until the effect of the railroad embargo has been determined.

Mid-year contracts for mill cinder and rolling scale are being closed in eastern Pennsylvania. At the beginning of the year contracts for the ensuing 12 months are usually made unless prices are considered too high by consumers, as was the case last January. The prevailing prices are now about 50c. per ton under what they were six months ago.

Output of Women Workers in British Shops

The restrictive methods of trade unions came in for some attention in the address of the new president of the Iron and Steel Institute of Great Britain, Sir William Beardmore, Parkhead Rolling Mills, Glasgow, Scotland. Early in the war it was found at the Parkhead Forge that the output from the respective machines was not so great as what the machines were designed for, and one of the workers was induced to do his best to obtain the most out of a machine. He very greatly increased his output, notwithstanding his predilection for trade-union restrictions.

When it was found that the demands of the Government for a greatly accelerated production of shells required the employment of girls in the projectile factory owing to the scarcity of skilled workers, these girls in all cases produced more than double that by thoroughly trained mechanics—members of the trade unions—working the same machines under the same conditions.

Three representative cases may be quoted thus: In the turning of the shell body the actual output by girls with the same machines and working under exactly the same conditions and for an equal number of hours was quite double that by trained mechanics. In the boring of shells the output was also quite double, and in the curving, waving and finishing of shell bases quite 120 per cent more than that of experienced mechanics. These conditions applied to war time when the peril of the nation demanded unselfish, patriotic exertion by everyone, and the men who thus limited the output can only be regarded as unworthy of the privileges of citizenship. In peace time the same results, due to restrictive measures, must necessarily handicap severely all manufacturers in their aim to advance the prosperity of the nation by ensuring adequate employment for all.

Annual Meeting of Cramp Company

At the annual meeting on June 29 of the William Cramp Ship & Engine Building Company, Philadelphia, the net profits for the fiscal year ended April 30 were stated to be equal to 17.2 per cent on the capital stock, compared with 10.6 per cent in the previous year. Retiring directors were re-elected, and at a later organization meeting of the board Henry S. Grove was re-elected president. In his annual report President Grove says in part: "We have unfilled contracts which will

occupy all our 'building ways' during the present year. Should the orderly progress of our work not be disturbed by labor difficulties or failure in delivery of material, we could accept orders for construction to begin in the spring of 1917."

The Otis Steel Company, Cleveland,*Ohio, has completed rebuilding its 72-in. plate mill at its Riverside works into an 84-in. mill. This is a three-high mill with roughing and finishing stands. The change has been made to supply the demand for light plates in wider widths than the company was able to produce on its 72-in. mill.

NEGOTIABLE BILL OF LADING

Congress Will Finally Provide for It—Carriers' Liability Made Definite

WASHINGTON, D. C., July 11, 1916.—After four years of continuous effort, the shipping and banking interests of the country are about to secure at the hands of the present Congress the passage of a bill requiring the use in interstate and foreign commerce of a uniform negotiable bill of lading. This legislation, which will affect annually consignments of merchandise valued at the fabulous sum of \$25,000,000,000, was first brought to the attention of Congress early in 1912 by the Commission on Uniform State Laws of the American Bar Association, the leading railroad systems, and the largest shippers' associations of the country. The measure is known as the Pomerene bill, having been strongly championed by the Senator from Ohio, and in a slightly modified form, covering intrastate transactions, has already become the law in Connecticut, Illinois, Iowa, Louisiana, Massachusetts, Maryland, Michigan, New York, Ohio, and Pennsylvania. The House leaders have given assurances that it will become a law at the present session.

Carefully prepared estimates submitted by the American Bankers' Association indicate that more than \$5,000,000,000 in cash is annually advanced on bills of lading. Notwithstanding the great importance of these documents as security for large advances, the evidence before the Senate and House committees demonstrates that frauds aggregating many million dollars annually have been perpetrated through the duplication and alteration of bills of lading, through the use as collateral of bills on which the goods have already been delivered to the consignees, and through wholesale forgeries of bills. In many cases, also, bills of lading have been rendered almost valueless for banking and credit purposes by the arbitrary action of carriers in marking them "Shipper's weight, load and count."

The Pomerene bill prohibits carriers from issuing duplicate bills of lading, except in specified instances, and in those cases the two copies are to be identified by being plainly stamped "original" and "duplicate." The alteration of bills of lading by addition or erasure after issue, without authority from the carrier, either in writing or noted on the bill, is declared to be void, and the bill made enforceable according to its original tenor. The use of "spent" bills of lading—i. e., those on which the goods have already been delivered—is penalized by the pending measure, and all carriers are required, when delivering goods, either to indorse plainly upon the bill a statement that the delivery has been made in whole or in part, as the case may be.

To put an end to the wholesale forgeries which the evidence before the Congressional committees shows to have been practised, the bill provides a fine of \$5,000 or imprisonment not exceeding five years, or both, for the alteration, forging, counterfeiting, or photographing of any bill of lading with intent to defraud. In order that bills of lading may faithfully represent the merchandise upon which they are issued, the bill provides that "when goods are loaded by a carrier, such carrier shall count the packages of goods, if package freight, and ascertain the kind and quantity, if bulk freight; and such carrier shall not, in such cases, insert in the bill of lading, or in any notice, receipt, contract, rule, regulation, or tariff, 'Shipper's weight, load and count,' or other words of like purport, indicating that the goods were loaded by the shipper and the description thereof made by him." This provision of the bill renders the carrier liable, without evasion, for the goods described in the bill of lading, which is thereby made sound collateral for bank loans.

In addition to correcting the abuses referred to, the Pomerene bill, according to the report of the House Committee, is a "codification of the law and principles now controlling, and which ought to control, interstate and foreign shipments; it defines the right and liabilities of the common carriers, consignors, consignees, and of the immediate owners or holders of bills of lading, and, if adopted, it will serve to make more uniform the commercial law of our country."

W. L. C.

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Steel Ingots and Rolled Products in 1915

New High Records in Plates and Sheets, Wire Rods, Bars and Black Plates for Tinning

The American Iron and Steel Institute has just published its statistics of production in 1915 of steel ingots and castings, and of various forms of iron and steel rolled products. The total output of ingots and castings was 32,151,036 gross tons—31,284,212 tons of ingots and 866,824 tons of castings. The total of all forms of finished rolled iron and steel was 24,392,924 tons, including 650,545 tons of forging billets and 562,418 tons of exported billets and sheet bars.

Included in the 23,679,102 tons of basic open-hearth steel ingots and castings produced in 1915 is 1,781,491 tons of duplex steel, metal partly purified in converters against 835,690 tons in 1914.

Wire rods made a remarkable showing (partly from the foreign barb wire demand), the total output being 3,095,907 gross tons, against 2,431,714 tons in 1914 and a previous record of 2,653,553 tons in 1912. Sheets and plates reached a high mark at 6,077,694 tons; black plates for tinning went to 1,093,345 tons; merchant bars to 4,131,242 tons, against a record of 3,957,609 tons in 1913, and concrete bars to 353,408 tons, the previous record being 319,670 tons in 1913. The tables below give interesting details:

PRODUCTION OF STEEL INGOTS AND CASTINGS.

PRODUCTION OF STEEL INGOTS AND CASTINGS BY PROCESSES.

Years	Open-hearth.			Bessemer.	Crucible.	Elec- tric.	Mis- cella- neous.	Total. Gross tons.
	Basic.	Acid.	Total.					
1901.	3,618,993	1,037,316	4,656,309	8,713,302	98,513	.....	5,471	13,473,595
1902.	4,496,533	1,191,196	5,687,729	9,138,363	112,772	.....	8,386	14,947,250
1903.	4,734,913	1,094,998	5,829,911	8,592,829	102,434	.....	9,804	14,534,978
1904.	5,106,367	801,799	5,908,166	7,859,140	83,391	.....	9,190	13,859,887
1905.	7,815,728	1,155,648	8,971,376	10,941,375	102,233	.....	8,963	20,023,947
1906.	9,658,760	1,321,653	10,980,413	12,275,830	127,513	.....	14,380	23,398,136
1907.	10,279,315	1,270,421	11,549,736	11,667,549	131,234	.....	14,075	23,362,594
1908.	7,140,425	696,304	7,836,729	6,116,755	63,631	.....	6,132	14,023,247
1909.	13,417,472	1,076,464	14,493,936	9,330,783	107,355	13,762	9,185	23,955,021
1910.	15,292,329	1,212,180	16,504,509	9,412,772	122,303	52,141	3,194	26,094,919
1911.	14,685,932	912,718	15,598,650	7,947,854	97,653	29,105	2,844	23,676,106
1912.	19,641,502	1,139,221	20,780,723	10,327,901	121,517	18,309	2,853	31,251,303
1913.	20,344,626	1,255,305	21,599,931	9,545,706	121,226	30,180	3,831	31,300,874
1914.	16,271,129	903,555	17,174,684	6,220,846	89,869	24,009	3,622	23,513,030
1915.	22,308,725	1,370,377	23,679,102	8,287,213	113,782	69,412	1,527	32,151,036

PRODUCTION OF STEEL INGOTS.

1901.	3,524,052	830,635	4,354,687	8,706,538	94,586	.....	214	13,156,025
1902.	4,384,129	935,721	5,319,850	9,125,815	107,817	.....	2,833	14,556,315
1903.	4,600,034	829,529	5,429,563	8,574,730	97,025	.....	3,395	14,104,713
1904.	5,007,448	597,884	5,605,332	7,843,089	79,083	.....	2,172	13,529,676
1905.	7,609,569	835,267	8,444,836	10,912,272	96,500	.....	2,572	19,463,180
1906.	9,345,212	915,310	10,260,522	12,243,229	117,170	.....	3,510	22,624,431
1907.	9,912,839	890,372	10,803,211	11,634,276	121,001	.....	989	22,559,477
1908.	6,985,420	539,532	7,524,952	6,096,196	55,360	.....	519	13,677,027
1909.	13,111,467	781,429	13,892,896	9,296,969	94,672	13,456	786	23,298,779
1910.	14,858,353	782,805	15,641,158	9,354,437	107,671	50,821	.....	25,154,087
1911.	14,419,306	608,153	15,027,459	7,890,753	83,623	27,227	417	23,029,479
1912.	19,197,504	712,371	19,909,875	10,259,151	100,967	14,147	542	30,284,682
1913.	19,884,465	805,250	20,689,715	9,465,200	103,655	20,973	587	30,280,130
1914.	15,936,985	633,382	16,570,367	6,154,964	78,683	15,458	312	22,819,784
1915.	21,975,822	968,148	22,943,970	8,194,737	99,026	46,348	331	31,284,212

PRODUCTION OF STEEL CASTINGS.

1901.	94,941	206,681	301,622	6,764	3,927	.....	5,257	317,570
1902.	112,404	255,475	367,879	12,548	4,955	.....	5,553	390,935
1903.	134,879	265,469	400,348	18,099	5,409	.....	6,409	430,265
1904.	98,919	203,915	302,834	16,051	4,308	.....	7,018	330,211
1905.	206,159	320,381	526,540	22,103	5,733	.....	6,391	560,767
1906.	313,548	406,343	719,891	32,601	10,343	.....	10,870	773,705
1907.	366,476	390,049	746,525	33,273	10,233	.....	13,066	803,117
1908.	155,005	156,772	311,777	20,559	8,271	.....	5,613	346,220
1909.	306,005	293,035	601,040	33,814	12,683	306	8,399	656,242
1910.	433,976	429,375	863,351	58,335	14,632	1,320	3,194	940,832
1911.	266,626	304,565	571,191	57,101	14,030	1,878	2,427	646,627
1912.	443,998	426,850	870,848	68,750	20,550	4,162	2,311	966,621
1913.	460,161	450,055	910,216	80,506	17,571	9,207	3,244	1,020,744
1914.	334,144	270,173	604,317	65,882	11,186	8,551	3,810	693,246
1915.	333,103	402,229	735,332	92,476	14,756	23,064	1,196	866,824

ALLOY STEEL INGOTS AND CASTINGS.

PRODUCTION OF ALLOY STEEL INGOTS AND CASTINGS.

Years.	Ingots.	Castings.	Total.	Years.	Ingots.	Castings.	Total.
1909.....	158,978	23,002	181,980	1913.....	625,430	88,927	714,357
1910.....	538,462	29,357	567,819	1914.....	577,107	69,846	646,953
1911.....	425,169	56,290	481,459	1915.....	923,251	97,896	1,021,147
1912.....	689,392	103,109	792,501	.....	.....	.....	.....

APPROXIMATE PRODUCTION OF ALLOY STEEL INGOTS AND CASTINGS, BY PROCESSES, GROSS TONS, 1915.

Processes.	Ingots.	Castings.	Total.
Open-hearth steel—basic.....	641,995	1,796	643,791
Open-hearth steel—acid.....	196,090	71,263	267,353
Bessemer steel.....	17,211	23,900	41,111
Crucible steel.....	40,107	841	40,948
Electric steel.....	27,848	96	27,944
Total.....	923,251	97,896	1,021,147

In 1915, 134 works in 20 States and the District of Columbia made steel ingots, against 123 works in 17 States and the District of Columbia in 1914.

In 1915, 218 works in 27 States, the District of Columbia, and the Canal Zone, Panama, made steel castings, against 216 works in 1914.

ROLLED IRON AND STEEL.

In 1915, the production of all kinds of iron and steel rolled into finished forms (including blooms, billets, and axle blanks rolled for forging purposes and semi-finished products which were rolled for export in that year) shows an increase of 6,022,728 tons, or 32.8 per cent., as compared with the output in 1914.

TOTAL PRODUCTION OF ALL KINDS OF FINISHED ROLLED IRON AND STEEL, 1887-1915.

Years	Iron and steel rails.	Plates and sheets.	Nail plate.	Wire rods.	Structural shapes.	All other finished rolled products.	Total. Gross tons.
1887.	2,139,640	603,355	308,432	.....	.....	2,184,279	5,235,706
1888.	1,403,700	609,827	289,891	279,769	.....	2,034,162	4,617,349
1889.	1,522,204	716,496	250,409	363,851	.....	2,374,968	5,236,928
1890.	1,885,307	809,981	251,828	457,099	.....	2,618,660	6,022,875
1891.	1,307,176	678,927	223,312	536,607	.....	2,644,941	5,390,963
1892.	1,551,844	751,460	201,242	627,829	453,957	2,570,482	6,168,814
1893.	1,136,458	674,345	136,113	537,272	387,307	2,104,190	4,975,685
1894.	1,021,772	682,900	108,262	673,402	360,305	1,795,570	4,642,211
1895.	1,306,135	991,459	95,065	791,130	517,920	2,487,845	6,189,574
1896.	1,122,010	965,776	72,137	623,986	495,571	2,236,361	5,516,841
1897.	1,647,892	1,207,286	94,054	970,736	583,790	2,497,970	7,001,728
1898.	1,981,241	1,448,301	70,188	1,071,683	702,197	3,239,760	8,513,307
1899.	2,272,700	1,903,505	85,015	1,036,398	850,376	4,146,425	10,294,419
1900.	2,385,682	1,794,528	70,245	846,291	815,161	3,575,536	9,487,443
1901.	2,874,639	2,264,425	68,850	1,365,934	1,013,150	4,772,329	12,349,327
1902.	2,947,933	2,665,409	72,936	1,574,293	1,300,326	5,383,219	13,944,116
1903.	2,992,477	2,599,665	64,102	1,503,455	1,095,813	4,952,185	13,207,697
1904.	2,284,711	2,421,398	61,601	1,699,028	949,146	4,597,497	12,013,381
1905.	3,375,929	3,532,230	64,542	1,808,688	1,660,519	6,398,107	16,540,015
1906.	3,977,887	4,182,156	54,211	1,871,614	2,118,772	7,383,828	19,588,468
1907.	3,633,654	4,248,832	52,027	2,017,583	1,940,352	7,972,374	19,864,822
1908.	1,921,015	2,649,693	45,747	1,816,949	1,083,181	4,311,608	11,528,193
1909.	3,023,845	4,234,346	63,746	2,335,685	2,275,562	7,711,506	19,644,690
1910.	3,636,031	4,955,484	45,294	2,241,830	2,666,890	8,475,750	21,621,279
1911.	2,822,790	4,488,049	48,522	2,450,453	1,912,367	7,316,990	19,039,171
1912.	3,327,915	5,875,080	45,331	2,653,553	2,846,467	9,908,475	24,656,841
1913.	3,502,780	5,751,037	37,503	2,464,807	3,004,972	10,030,144	24,791,243
1914.	1,945,095	4,719,246	38,573	2,431,714	2,031,124	7,204,444	18,370,196
1915.	2,204,203	6,077,694	31,929	3,095,907	2,437,003	10,546,188	24,392,924

PRODUCTION OF PLATES AND SHEETS.

PRODUCTION OF IRON AND STEEL PLATES AND SHEETS,
1888-1915.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1888.....	609,827	1896.....	1,448,301	1908.....	2,649,693
1889.....	716,496	1899.....	1,903,505	1909.....	4,234,346
1890.....	809,981	1900.....	1,794,528	1910.....	4,955,484
1891.....	678,927	1901.....	2,254,425	1911.....	4,488,049
1892.....	751,460	1902.....	2,665,409	1912.....	5,875,080
1893.....	674,345	1903.....	2,599,665	1913.....	5,751,037
1894.....	682,900	1904.....	2,421,398	1914.....	4,719,246
1895.....	991,459	1905.....	3,532,230	1915.....	6,077,694
1896.....	965,776	1906.....	4,182,156		
1897.....	1,207,286	1907.....	4,248,832		

PRODUCTION OF PLATES AND SHEETS BY SIZE AND MODE OF
MANUFACTURE, GROSS TONS, 1915.

Kinds of products.	Iron.	Steel.	Total.
Universal plates, inc. flats or bars over 6 in. wide:			
$\frac{1}{4}$ of an inch and over in thickness.....	1,525	903,501	905,026
Under $\frac{1}{4}$ of an inch thick.....		49,826	49,826
Total universal plates.....	1,525	953,327	954,852
Sheared plates:			
$\frac{1}{4}$ of an inch and over in thickness.....	562	1,458,860	1,459,422
Under $\frac{1}{4}$ of an inch thick.....	200	463,577	463,777
Total sheared plates.....	762	1,922,437	1,923,199
Black sheets, made on either sheet or job. mills:			
No. 12 gauge and thicker.....	1,152	159,057	160,209
No. 13 gauge and thinner.....	14,776	1,061,801	1,076,577
Total black sheets.....	15,928	1,820,858	1,836,786
Black plates rolled on tin mills:			
Black plates for tinning.....	2,038	1,091,307	1,093,345
Other black plate specialties.....		269,512	269,512
Total black plates rolled on tin mills.....	2,038	1,360,819	1,362,857
Grand total of plates and sheets.....	20,253	6,057,441	6,077,694

In 1915, 32 works made black plates for tinning.

PRODUCTION OF WIRE RODS.

PRODUCTION OF WIRE RODS, GROSS TONS, 1888-1915.

Years.	Tons.	Years.	Tons.	Years.	Tons.	Years.	Tons.
1888.....	279,769	1895.....	791,130	1902.....	1,574,293	1909.....	2,335,685
1889.....	363,851	1896.....	623,986	1903.....	1,503,455	1910.....	2,241,830
1890.....	457,099	1897.....	970,736	1904.....	1,699,028	1911.....	2,450,453
1891.....	536,607	1898.....	1,071,683	1905.....	1,808,688	1912.....	2,653,553
1892.....	627,829	1899.....	1,036,398	1906.....	1,871,614	1913.....	2,464,807
1893.....	537,272	1900.....	846,291	1907.....	2,017,583	1914.....	2,431,714
1894.....	673,402	1901.....	1,365,934	1908.....	1,816,949	1915.....	3,095,907

Small quantities of copper-clad steel wire rods are included in the totals for recent years. It was necessary to estimate the output of one wire-rod plant in 1915.

PRODUCTION OF STRUCTURAL SHAPES.

PRODUCTION OF STRUCTURAL SHAPES, GROSS TONS, 1892-1915.

Years.	Tons.	Years.	Tons.	Years.	Tons.
1892.....	453,957	1900.....	815,161	1908.....	1,083,181
1893.....	387,307	1901.....	1,013,150	1909.....	2,275,562
1894.....	360,305	1902.....	1,300,326	1910.....	2,266,890
1895.....	517,920	1903.....	1,095,813	1911.....	1,912,367
1896.....	495,571	1904.....	940,146	1912.....	2,846,487
1897.....	583,790	1905.....	1,660,519	1913.....	3,004,972
1898.....	702,197	1906.....	2,118,772	1914.....	2,031,124
1899.....	850,376	1907.....	1,940,352	1915.....	2,437,003

PRODUCTION OF HEAVY AND LIGHT STRUCTURAL SHAPES,
GROSS TONS, 1912-1915.

Years.	Heavy shapes.	Light shapes.	Total.
1912.....	2,470,415	376,072	2,846,487
1913.....	2,553,806	451,166	3,004,972
1914.....	1,787,281	243,843	2,031,124
1915.....	2,031,407	405,596	2,437,003

PRODUCTION OF MERCHANT BARS.

PRODUCTION OF MERCHANT BARS, SHOWING IRON AND STEEL
MERCHANT BARS SEPARATELY, GROSS TONS, 1905-1915.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905.....	1,322,439	2,271,162	3,593,601	1911.....	835,625	2,211,737	3,047,362
1906.....	1,481,348	2,510,852	3,992,200	1912.....	944,790	2,752,324	3,697,114
1907.....	1,440,356	2,530,632	3,970,988	1913.....	1,026,632	2,930,977	3,957,609
1908.....	685,233	1,301,405	1,986,638	1914.....	563,171	1,960,460	2,523,631
1909.....	952,230	2,311,301	3,263,531	1915.....	657,107	3,474,135	4,131,242
1910.....	1,074,163	2,711,568	3,785,731				

PRODUCTION OF CONCRETE BARS.

PRODUCTION OF CONCRETE BARS, SHOWING IRON AND STEEL
CONCRETE BARS SEPARATELY, GROSS TONS, 1909-1915.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1909.....	.....	159,352	159,352	1913.....	113	319,557	319,670
1910.....	4,645	236,464	241,109	1914.....	.....	288,471	288,471
1911.....	2,383	256,353	258,741	1915.....	.....	353,408	353,408
1912.....	2,500	271,832	274,332				

Statistics are not available prior to 1909.

PRODUCTION OF SKELP.

PRODUCTION OF SKELP, SHOWING IRON AND STEEL SKELP
SEPARATELY, GROSS TONS, 1905-1915.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905.....	452,797	983,198	1,435,995	1911.....	322,397	1,658,276	1,980,673
1906.....	391,517	1,137,068	1,528,585	1912.....	327,012	2,119,804	2,446,816
1907.....	444,536	1,358,091	1,802,627	1913.....	312,746	2,189,218	2,501,964
1908.....	297,049	853,534	1,150,583	1914.....	264,340	1,718,091	1,982,431
1909.....	370,151	1,663,230	2,033,381	1915.....	262,198	2,037,266	2,299,464
1910.....	350,578	1,477,616	1,828,194				

In 1915, 45 plants in 5 States rolled iron or steel skelp, as compared with 46 works in 6 States in 1914.

PRODUCTION OF MISCELLANEOUS ROLLED
PRODUCTS.PRODUCTION OF MISCELLANEOUS ROLLED IRON AND STEEL
PRODUCTS, GROSS TONS, 1915.

Miscellaneous rolled products.	Iron.	Steel.	Total.
Hoops.....	300	281,459	281,759
Bands and cotton-ties.....	200	437,787	437,987
Long angle splice bars, fish-plate bars, tie-plate bars, and other rail joint shapes.....	54,678	480,937	535,615
Roller sheet piling, not including fabricated.....		24,026	24,026
Railroad ties.....		42,269	42,269
Roller forging blooms, forging billets, etc.....	570	649,975	650,545
Blooms, billets, sheet bars, etc., for export.....	1,231	561,187	562,418
Spike and chain rods, bolt and nut rods, horseshoe bars, strips, etc.....	289,218	938,237	1,227,455
Total.....	346,197	3,415,877	3,762,074

PRODUCTION OF FINISHED ROLLED IRON AND STEEL BY LEADING
PRODUCTS, GROSS TONS, 1915.

Products.	Iron.	Steel.	Total.
Rails.....	.....	2,204,203	2,204,203
Plates and sheets.....	20,253	6,057,441	6,077,694
Nail and spike plate.....	4,984	26,945	31,929
Wire rods.....	2,236	3,093,671	3,095,907
Structural shapes.....	1,858	2,435,145	2,437,003
Merchant bars.....	657,107	3,474,135	4,131,242
Bars for reinforced concrete work.....	.....	353,408	353,408
Skelp, flue, and pipe iron or steel.....	262,198	2,037,266	2,299,464
Long angle splice bars, tie-plate bars, etc.....	54,678	480,937	535,615
Hoops.....	300	281,459	281,759
Bands and cotton-ties.....	200	437,787	437,987
Roller sheet piling, not including fabricated.....	.....	24,026	24,026
Railroad ties.....	.....	42,269	42,269
Roller forging blooms, forging billets, etc.....	570	649,975	650,545
Exports of blooms, billets, sheet bars, etc.....	1,231	561,187	562,418
All other finished rolled products.....	289,218	938,237	1,227,455
Total.....	Gross tons. 1,294,833	23,098,091	24,392,924

Iron and Steel Markets

AGRICULTURAL BARS AT 2.35c

Foreign Steel Demand Is Still Heavy

Large Orders for Rails and Barb Wire—Allies Want 100,000 Tons More of the Latter

New foreign buying both for war and peace uses continues to be the mainstay of the steel market. In only one direction has domestic demand made itself felt in the past week; that was in the placing of orders for the first half of 1917 by a portion of the agricultural implement manufacturers. Of this business the Steel Corporation took 80,000 tons at 2.35c., Pittsburgh, for bars and 2.60c. for small shapes. For bars this is .15c. below what most mills have held out for on such contracts.

The buying of the Allied countries is heavy and promises to be so for months. Russia's tonnages are spectacular. Her much announced rail orders as now rounded up represent fully 365,000 tons and more rails are wanted. In fact, the question is how much our mills can guarantee to deliver by the middle of 1917. Lackawanna, Cambria and Bethlehem mills share these orders with the Steel Corporation. The French Government asks for 20,000 tons additional rails. Great Britain, after putting 50,000 tons on the Steel Corporation's books in the past three months, still seeks more, and with Canadian mills trying to buy rail blooms on this side it is a question how much they can take of the 30,000-ton inquiry that has just come from the Canadian Pacific. The Russian rails were high-priced, but the \$52 widely published includes spikes and splice bars.

The other striking feature in export trade is 165,000 tons of barb wire for Russia, just closed by the Steel Corporation. This has long hung over the market. The Allies are still trying to place 100,000 tons of barb wire, in addition to a round lot wanted for Italy.

In exports apart from war is an inquiry for 30,000 tons of small bars. Indicating that the shell-steel orders have not given out, Pittsburgh was asked Wednesday to take on 70,000 tons of rounds for Great Britain, but mills there cannot make the deliveries wanted. Canadian buyers are in the market for shell forgings for the second quarter of 1917.

Indications are that the July output of the mills will fall below the June rate, as the 4th of July shut-down stretched out to 48 hours in some cases, and hot weather is now cutting down production. These factors are offsetting some of the new steel capacity scheduled to come in from time to time.

Prices have had little testing apart from the agricultural bar trade. In Bessemer billets there have been sales at \$40, Pittsburgh, including one of 9000 tons, indicating some easing up, though for open-hearth \$42 is paid. Third quarter Bessemer bars have sold at 2.50c., and there is some structural

steel to be had at close to that figure. On plain wire the leading producer has advanced its price from \$2.45 to \$2.65, or \$4 a ton, but other sellers have not followed as yet.

The plate market, after some irregularity lately, is tightening, and 3.5c. and 4c. sales are common. Three vessels just placed with Pacific Coast yards will require 10,000 tons. In the Eastern market inquiry for 25,000 to 30,000 tons has come out. There is some sounding of plate mills here by British interests in view of their government's willingness to permit some collier and refrigerator boat construction.

An export order out of the beaten track is for 7000 tons of line pipe for Borneo. At home Oklahoma oil interests have closed for 200 miles of 8-in. pipe, deliveries to start in August, and in another case 40 miles of 12-in. pipe has been taken.

In special steel work, inquiry for 5000 tons of nickel steel from automobile manufacturers and the sale of two 1000-ton lots of electric steel billets for export are of interest.

No little comment has been made on the offering of 300,000 boxes of tin plate by Pittsburgh dealers. It is understood that an Ohio mill, inactive for some time, will produce this material; it may also roll sheets.

A Cleveland furnace interest has sold 20,000 tons of Bessemer iron to Italy, for shipment in the third quarter, at \$21.50. Two or three furnaces are being put on Bessemer iron, and more would follow but in view of the Mesaba situation ore dealers are chary of undertaking new contracts to deliver Bessemer grades.

Pittsburgh

PITTSBURGH, PA., July 11, 1916.

July is likely to show a large falling off in output of nearly all kinds of iron and steel products, as compared with June. July came in on Saturday, a short day; Sunday there was no output; Monday, many plants operated short handed, and Tuesday was a holiday. Thus in the first four days of the month output was at a low ebb. In addition, the hot weather is keeping down output, and this will offset to a large extent the falling off in new orders. The local market is stronger to-day than it was a month ago, and in Bessemer and open-hearth steel there is a heavy export demand. In some lines there is seasonable dullness, notably in wire products, for which new demand is quiet and specifications against contracts not very active. Pig iron is in better demand, and some export inquiry has come up lately for foundry iron. Bessemer and open-hearth billets have sold at \$40 to \$45, with the supply of the latter still short. Plates continue to be very active, with prices ruling strong. The low prices on spelter are likely to result before long in a lower market on galvanized products, particularly in wire and pipe. The scrap market has quieted down again, following the recent heavy purchases here and in Chicago of the Carnegie Steel Company. The hot weather is pulling down output of coke, and prompt furnace coke is scarce, readily bringing \$2.75 per net ton at oven, or higher. There is a strong belief that a buying movement in steel will develop late in August or early in September, as many consumers have not covered their needs for last quarter. The only change in prices during the week

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At date, one week, one month, and one year previous

	July 12, 1916.	July 5, 1916.	June 14, 1916.	July 14, 1915.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia...	\$19.75	\$19.75	\$20.00	\$14.25
No. 2, Valley furnace...	18.25	18.25	18.00	12.75
No. 2, Southern, Cin'ti...	16.90	16.90	17.40	12.65
No. 2, Birmingham, Ala.	14.00	14.00	14.50	9.75
No. 2, furnace, Chicago*	19.00	19.00	19.00	13.00
Basic, del'd, eastern Pa.	19.00	19.50	19.75	14.00
Basic, Valley furnace...	18.00	18.00	18.00	12.00
Bessemer, Pittsburgh...	21.95	21.95	21.95	14.95
Malleable Bess., Ch'go*	19.50	19.50	19.50	13.00
Gray forge, Pittsburgh...	18.70	18.70	18.70	13.45
L. S. charcoal, Chicago...	19.75	19.75	19.75	15.75

Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh...	40.00	42.00	45.00	21.00
O.-h. billets, Pittsburgh...	42.00	42.00	40.00	22.00
O.-h. sheet bars, P'gh...	42.00	42.00	40.00	22.50
Forging billets, base, P'gh	69.00	69.00	69.00	27.00
O.-h. billets, Phila.	45.00	50.00	50.00	24.56
Wire rods, Pittsburgh...	55.00	50.00	55.00	25.50

Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47 1/2	1.47 1/2	1.47 1/2	1.25
O.-h. rails, heavy, at mill	1.56 1/2	1.56 1/2	1.56 1/2	1.34
Iron bars, Philadelphia...	2.659	2.659	2.659	1.22 1/2
Iron bars, Pittsburgh...	2.50	2.50	2.60	1.25
Iron bars, Chicago...	2.35	2.35	2.35	1.20
Steel bars, Pittsburgh...	2.75	2.75	2.75	1.25
Steel bars, New York...	2.669	2.919	2.919	1.419
Tank plates, Pittsburgh...	3.50	3.25	3.75	1.20
Tank plates, New York...	3.409	3.419	3.919	1.369
Beams, etc., Pittsburgh...	2.50	2.50	2.50	1.25
Beams, etc., New York...	2.669	2.669	2.669	1.419
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.20
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.25
Steel hoops, Pittsburgh...	2.75	2.75	2.75	1.30

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	2.90	2.90	2.90	1.75
Galv. sheets, No. 28, P'gh.	4.50	4.50	4.75	4.50
Wire nails, Pittsburgh...	2.50	2.50	2.50	1.60
Cut nails, Pittsburgh...	2.60	2.60	2.60	1.55
Fence wire, base, P'gh...	2.45	2.45	2.45	1.40
Barb wire, galv., P'gh...	3.35	3.35	3.35	2.50

Old Material, Per Gross Ton:				
Iron rails, Chicago...	18.50	18.00	18.00	12.25
Iron rails, Philadelphia...	20.00	20.00	20.00	15.00
Carwheels, Chicago...	12.00	12.00	12.75	11.00
Carwheels, Philadelphia...	15.00	16.00	16.50	12.50
Heavy steel scrap, P'gh.	16.50	16.00	16.00	11.75
Heavy steel scrap, Phila.	15.00	14.75	15.50	12.00
Heavy steel scrap, Ch'go	14.00	14.00	14.75	10.25
No. 1 cast, Pittsburgh...	15.75	15.75	16.00	12.25
No. 1 cast, Philadelphia...	16.00	16.00	16.50	12.25
No. 1 cast, Ch'go (net ton)	11.50	11.50	11.75	9.25

Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt...	\$2.75	\$2.75	\$2.40	\$1.60
Furnace coke, future...	2.50	2.50	2.50	1.75
Foundry coke, prompt...	3.25	3.25	3.25	2.00
Foundry coke, future...	3.50	3.50	3.50	2.25

Metals,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	26.00	27.00	28.00	22.00
Electrolytic copper, N. Y.	25.75	26.50	27.75	19.50
Spelter, St. Louis...	8.75	10.75	13.25	21.75
Spelter, New York...	9.00	11.00	13.50	22.00
Lead, St. Louis...	6.25	6.65	6.70	5.50
Lead, New York...	6.45	6.85	6.85	5.65
Tin, New York...	38.50	38.87 1/2	43.25	38.12 1/2
Antimony, Asiatic, N. Y.	15.50	16.00	20.00	36.00
Tin plate, 100-lb. box, P'gh.	\$6.00	\$6.00	\$5.75	\$3.10

was an advance of \$4 a ton on plain annealed wire, made by the American Steel & Wire Company to manufacturers, effective July 8.

Pig Iron.—W. P. Snyder & Company report the average price of Bessemer iron in June to have been \$21, and of basic, \$18, at valley furnace. These were the figures quoted in this report all of last month. There is still a heavy export inquiry for Bessemer iron, and a sale of 10,000 tons for export to Italy is reported at \$21, valley furnace, but it is not believed the iron will come from the valleys. On 2500 tons, also for export to Italy, but for prompt shipment, the boat being in New York waiting for it, \$21.50 at valley furnace was paid. Some export inquiry has come up for foundry iron, but so far this amounts only to 3000 to 4000 tons. The Colonial Steel Company of this city bought only 3000 tons of basic on its inquiry for 10,000 tons, the business being taken by a local dealer at \$18 at valley furnace. The United Steel Company at Canton, Ohio, bought 15,000 tons of basic, equal deliveries August, September and October, from a Mahoning Valley furnace that has a low rate of freight to Canton, at \$18 at furnace. It is believed the low prices ruling on heavy steel scrap are keeping down prices of basic iron, which show no sign of advancing, although the available supply for the open market is limited. An inquiry is in the market for about 10,000 tons of Bessemer iron, silicon running 1.50 to 2.50 per cent, and we note a sale of 5000 tons of standard Bessemer at \$21, valley furnace, for shipment to Midland, Pa., for ingot molds. We quote Bessemer iron at \$21; basic, \$18; gray forge, \$17.75 to \$18; malleable Bessemer, \$18.50 to \$19, and No. 2 foundry, \$18.25 to \$18.50, all at valley furnace, the freight rate to the Pittsburgh and Cleveland districts being 95c. per gross ton.

Ferroalloys.—Consumers of ferromanganese seem to be well covered for the near future, at least, and there is little new inquiry. Foreign 80 per cent is still held \$175, seaboard, for 1917 delivery, but with no guarantee as to shipments. Domestic 80 per cent, with the supply getting larger, is quoted at \$175 to \$200 for delivery this year or into next year. There is still a scarcity in supply of prompt ferromanganese, and it is quoted at \$200 to \$225 in carload lots, probably with no trouble in buying at the lower figure. Spiegeleisen seems to be easier. We quote 18 to 22 per cent at \$45 to \$50, and 25

to 30 per cent at \$60 to \$70 at furnace. We quote 50 per cent ferrosilicon at \$85 for lots up to 100 tons; over 100 tons and up to 600 tons, \$84, and over 600 tons, \$83, all per gross ton, f.o.b. Pittsburgh. Prices of Bessemer ferrosilicon for delivery over remainder of the year are now quoted as follows: 9 per cent, \$32; 10 per cent, \$33; 11 per cent, \$34; 12 per cent, \$35; 13 per cent, \$36.50; 14 per cent, \$38.50; 15 per cent, \$40.50, and 16 per cent, \$43. Seven per cent silvery for the same delivery is \$28.50; 8 per cent, \$29; 9 per cent, \$29.50; 10 per cent, \$30; 11 per cent, \$31, and 12 per cent, \$32. These prices are f.o.b. at furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., all having a freight rate of \$2 per gross ton to Pittsburgh.

Billets and Sheet Bars.—There is a continued heavy export demand for soft Bessemer or open-hearth billets or sheet bars, but not much business is being closed up, as the supply is very limited. Two or three makers of billets and sheet bars that lately had some steel to spare for the open market, now say they are out of it and have no more steel to sell. We note a sale of 9000 tons of Bessemer billets at \$40. There would be little trouble in getting \$42, f.o.b. Pittsburgh, for open-hearth billets or sheet bars; the chief trouble would be to find the steel. Occasionally a consumer who has a contract for steel, and has to specify for certain shipments in a definite period, offers some billets and sheet bars at \$40 or slightly less, but this steel is very quickly taken up. A sale of 500 tons of 4x4-in. open-hearth billets was made lately to a dealer at \$41, and the dealer sold the steel at \$42.50 to a consumer. A leading interest has adjusted its contracts for sheet bars for third quarter delivery at very close to \$40 at maker's mill. We quote soft open-hearth billets and sheet bars at \$42 to \$45; Bessemer billets, \$40 to \$42, and Bessemer sheet bars, \$40 to \$42, maker's mill, Pittsburgh or Youngstown district. We quote forging billets at \$69 for sizes up to but not including 10x10-in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 extra.

Plates.—The situation in plates seems to be tightening up, and prompt plates are harder to obtain to-day than a month ago. One mill reports that it is getting 4c. per lb. for sheared plates for delivery in three to four months, and another mill is getting 3.50c. or higher

for slightly quicker delivery. New inquiries for steel cars are light. The Pressed Steel Car Company has taken an order for 60 steel ore cars, and the Baltimore & Ohio is reported in the market for 1000 steel cars. We quote sheared plates, $\frac{1}{4}$ -in. and heavier, for delivery in six weeks to three months at 3.50c. to 4c., while the mill price remains at 2.75c., but probably not for delivery before first quarter or first half of 1917. Two leading mills have their entire output of plates practically sold up for remainder of this year, with considerable sales for first half of next year.

Structural Material.—New inquiry has been fairly heavy. The McClintic-Marshall Company has taken 9000 tons for a terminal building for the Northern Ohio Traction & Light Company, Akron, Ohio, 1600 tons for an extension to buildings of the Toledo Glass Company at Glassboro, N. J., and 1200 tons for plant extensions for the same company at Clarksburg, W. Va. The Blaw Structural Steel Company has taken 650 tons for an extension to the Ludlum Steel Company plant at Water Belt, N. Y.; the Cambria Steel Company 300 tons for the Worth Bros. Company plant at Coatesville, Pa., and the American Bridge Company about 3000 tons of bridge work for the Pennsylvania Railroad, 300 tons of bridge work for the Florida East Coast Railroad and 600 tons for a subway station for the Pennsylvania Railroad. The Jones & Laughlin Steel Company will furnish 100 tons for an addition to a foundry at Cortland, N. Y. We quote beams and channels up to 15 in. at 2.50c. to 2.75c. at mill for delivery in third and fourth quarters, while small lots from stock are held at 3.25c. up to 4c., prices depending entirely on the size of the order and how soon deliveries are wanted.

Steel Rails.—One of the Canadian roads is reported in the market for 25,000 tons of standard sections, but it is said the best delivery one interest could offer was third quarter of 1917. There is not much new demand, nearly all the railroads being covered on their needs of rails for next year. The Carnegie Steel Company is sold up on both standard sections and light rails to about Oct. 1, 1917. The new demand for light rails is only fair, and it is said a good deal of the business being placed is going to the rerolling rail mills, which have been naming lower prices for rerolled rails than are being quoted on new light rails. We quote 25 to 45-lb. sections at \$47; 16 and 20-lb., \$48; 12 and 14-lb., \$49, and 8 and 10-lb., \$50 in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at 1.47½c. and of open-hearth, 1.56½c., Pittsburgh.

Sheets.—There is an insistent heavy demand for electrical sheets, much beyond the capacity of the mills to supply. This is also largely true of blue annealed, but for light black and galvanized sheets new demand is quiet, prices on galvanized being weak, due to the recent heavy decline in spelter. Some mills that made contracts with their customers for galvanized sheets at around 5c. when spelter was 18c. to 20c. per lb. are insisting that these sheets be taken out. Deliveries of Bessemer and open-hearth sheet bars by the mills are better than for a long time. We quote blue annealed sheets, Nos. 9 and 10, at 3c. to 3.25c., for delivery at convenience of the mill, which would be late this year. We quote No. 28 Bessemer and open-hearth black sheets at 2.90c. to 3c.; No. 28 galvanized, Bessemer and open-hearth, 4.50c. to 4.60c.; Nos. 22 and 24 black plate, tin mill sizes, H. R. & A., 2.90c.; Nos. 25, 26 and 27, 3c. to 3.10c.; No. 28, 3.10c. to 3.15c., and No. 29, 3.20c. to 3.25c. These prices are for carloads and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—Some comment is being caused in the trade by the offering by a second-hand machinery concern of 300,000 boxes of terne plate, the question being whether this plate is already made up, or whether it is still to be made by some mill that has been idle for a good while. Domestic demand for tin plate is fairly heavy, some consumers wanting fairly large lots for delivery in the last quarter of this year. The export demand is only fairly active, nearly all the domestic mills having their output sold up for this year and not being able to quote on foreign inquiries. We quote wasters

from stock at \$5.75 and primes at \$6 for the domestic trade, while for export \$6.25 to \$6.50 per base box at mill is quoted. We quote 8-lb. coated ternes at \$8.50 to \$8.75 for 200 lb. and \$8.75 to \$9 for 214 lb., all f.o.b. at maker's mill.

Skelp.—There is not much new inquiry, but the mills are well sold up over remainder of this year and prices are very firm. We quote grooved steel skelp at 2.35c. to 2.40c.; sheared steel skelp, 2.45c. to 2.50c.; grooved iron skelp, 2.70c. to 2.80c., and sheared iron skelp, 3c. to 3.10c., all delivered to consumers' mills in the Pittsburgh district.

Cold-Rolled Strip Steel.—Contract inquiry for remainder of this year has quieted down, nearly all consumers being covered, but there is a fair inquiry for small lots for shipment within the next two or three months. A contract for 350 tons has been made at \$6 per 100 lb. for delivery over remainder of this year. On small lots for shipment in two to three months, the mills quote from \$6.50 to \$7, or higher, per 100 lb. On contracts we quote cold-rolled strip steel at \$6 per 100 lb., base, and on small lots for fairly prompt delivery, from \$6.50 to \$7. Extras, standard with all the mills, were printed on page 810 of THE IRON AGE of March 30.

Railroad Spikes.—No new inquiry has come out lately, and the local spike market is very quiet. Specifications from railroads are not coming in very freely, and some makers of spikes who find they have not enough orders to run their spike mills full are diverting the steel to other products. Regular prices, but which have been shaded some recently, are as follows:

Standard railroad spikes, $4\frac{1}{2}$ x 9/16 in. and larger, \$2.65 to \$2.75; railroad spikes, $\frac{1}{2}$ and 7/16 in., \$2.75 base; railroad spikes, $\frac{3}{8}$ in. and 5/16 in., \$3.05 base; boat spikes, \$2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Nuts and Bolts.—The domestic demand is only fair, but for export is quite heavy, and some contracts for shipment to the other side have lately been placed with local makers. Consumers are well covered for remainder of this year, and makers are sold up for the same period. Discounts in effect from May 19, which the makers state are for prompt acceptance only, are as follows, delivered in lots of 300 lb. or more where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50; large, 40.

Machine bolts, h. p. nuts, small, rolled thread, 50, 10 and 5 per cent; small, cut thread, 50 and 5; large, 40 and 10.

Machine bolts, c. p. c. and t. nuts, small, 40, 10 and 5 per cent; large, 35 and 5. Blank bolts, 40 and 10 per cent; bolt ends with h. p. nuts, 40 and 10; with c. p. nuts, 35 and 5. Rough stud bolts 15. Lag screws (cone or gimlet point), 50 and 10.

Forged set screws and tap bolts, 10 per cent. Cut and round point set screws, case hardened, 60. Square and hexagon head cap screws, 55. Flat, button, round or fillister head cap screws, 30.

Nuts, h. p. sq., tapped or blank, \$2.90 off list; hex., \$2.90 off; c. p. c. and t. sq. tapped or blank, \$2.60 off; hex., \$3 off; semi-finished hex., 60 and 10 per cent; finished and case hardened, 60 and 10.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 10 per cent.

Wire Rods.—New demand for wire rods has been heavier in the past two or three weeks, and with the available supply very limited, prices are higher. We note a recent sale of 2000 tons of soft rods, either Bessemer or open-hearth at option of the mill, for delivery over third quarter at \$55 at mill, and this is now said to be minimum of the market. We, therefore, quote soft Bessemer, open-hearth and chain rods at \$55 to \$60 per ton, f.o.b. Pittsburgh.

Wire Products.—Effective Saturday, July 8, the American Steel & Wire Company advanced prices on plain annealed wire for delivery to manufacturers in last quarter of the year \$4 per ton, or from \$2.45 to \$2.65 per 100 lb. No change was made in prices of wire nails or in galvanized wire products. The heavy declines in prices of spelter lead some in the trade to believe that prices on galvanized wire products may be lowered in the near future, but nothing official has appeared on this. The new demand for wire nails and

wire is quiet, the usual summer dullness being felt in the trade, but shipments by the mills are fairly heavy. Regular prices are as follows: Wire nails, \$2.50 to \$2.60 per keg; galvanized, 1 in. and longer, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Plain annealed wire, \$2.45 to \$2.65 per 100 lb.; galvanized wire, \$3.15; galvanized barb wire and fence staples, \$3.35; painted barb wire, \$2.65; polished fence staples, \$2.65; cement coated nails, \$2.50, base, all f.o.b., Pittsburgh, with freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are now 61½ per cent off list for carload lots, 60½ per cent for 1000-rod lots and 59½ per cent for small lots, f.o.b., Pittsburgh.

Iron and Steel Bars.—While some contracts from implement makers for steel bars have been closed for delivery in first half of 1917, a number of the larger implement makers are still holding off, refusing to pay the 2.50c. price for which the mills are holding. Specifications against contracts for steel bars are very active, and it is claimed there have been no cancellations of contracts, but in a few cases consumers are not specifying as freely against contracts as they were some time ago. The two leading makers of steel bars report their output well sold up for remainder of this year. The new demand for iron bars is fairly active, but most consumers are covered over the next four or five months. Leading makers are quoting steel bars at 2.50c. at mill for such deliveries as they can make, which would not be before last quarter of this year, or first quarter of 1917. One large maker is quoting Bessemer steel bars at 2.50c. at mill for delivery in six weeks to three months from date of order. Small lots of steel bars for delivery from warehouse are held at 2.75c. to 3c., depending on quantity. We quote refined iron bars at 2.50c. to 2.60c. and railroad test bars at 2.70c. to 2.80c. at mill.

Rivets.—The new demand has quieted down somewhat, most consumers being covered over remainder of the year, and specifications against contracts are reported active. There is a fair amount of export inquiry. Makers' prices, which are sometimes shaded by jobbers, are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, at \$4 per 100 lb., base, and conehead boiler rivets, same sizes, \$4.10 per 100 lb., base, f.o.b., Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Shafting.—Nearly all consumers are covered for the remainder of this year, and makers say they have specifications in hand to take their entire output over the next four or five months. Some contracts were made at 20 per cent off list, and on a few smaller ones, 15 per cent off list. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b., Pittsburgh, freight added to point of delivery.

Cotton Ties.—Nearly all the cotton tie contracts for this year have already been placed at \$1.35 per bundle of 45 lb., f.o.b., Pittsburgh. The price advances ¼c. per bundle for August and an additional ¼c. for September shipment.

Merchant Steel.—The new demand is fairly active, but nearly all consumers are covered ahead for the next four or five months. Prices on small lots are about as follows: Iron-finished tire, ½ x 1½ in. and larger, 2.50c., base; under ½ x 1½ in., 2.60c.; planished tire, 2.70c.; channel tire, ¾ to 1 in., 2.85c. to 2.95c.; 1½ in. and larger, 3.25c.; toe calk, 2.95c. to 3.05c., base; flat sleigh shoe, 2.70c.; concave and convex, 2.75c.; cutter shoe, tapered or bent, 3.25c. to 3.35c.; spring steel, 2.95c. to 3.05c.; machinery steel, smooth finish, 2.75c.

Hoops and Bands.—The market is quiet, as nearly all consumers are covered over remainder of this year. We quote steel hoops at 2.75c. and steel bands at 2.50c., with extras on the latter as per the steel-bar card.

Wrought Pipe.—It develops that the recent order placed by an Oklahoma oil interest with a Youngstown, Ohio, mill was for 200 miles of 8-in. line pipe, deliveries to start in August, and the same maker has taken

another order for 40 miles of 12-in pipe. The current demand for oil country goods is very heavy and prices are firm. On lap weld pipe some mills report they are sold up through first quarter of 1917, but on butt weld sizes they can make prompt delivery. Jobbers are going slowly in placing orders for black and galvanized pipe, particularly for the latter, owing to the heavy decline in prices of spelter. In a few cases some jobbers that have fairly heavy stocks of galvanized pipe have named lower discounts than the mills quote. However, discounts on both black and galvanized iron and steel pipe, printed on another page, are reported as being quite firmly held.

Boiler Tubes.—On both locomotive and merchant tubes the mills are sold up for the next eight or nine months on all the product they can possibly turn out, and premiums are asked over regular prices for fairly prompt shipment. Discounts on both iron and steel boiler tubes, printed on another page, are firm.

Old Material.—As near as can be learned, the purchases of heavy steel scrap, including borings and turnings, of the Carnegie Steel Company recently amounted to 40,000 to 50,000 tons, though last week they were estimated considerably higher. It is said that for part of the heavy steel scrap the company paid as high as \$17 and \$17.25, but a less price for the remainder. Another local interest has bought 4000 to 5000 tons of heavy steel scrap in the past week at \$16.75 to \$17, and a Shenango Valley furnace company has bought 3000 to 4000 tons of borings and turnings at about \$8.50, delivered. The Carnegie Steel Company is said to have covered its needs of scrap and the situation has quieted down a good deal. Borings and turnings are slightly higher, but an embargo against these when routed to Brackenridge, Pa., where the leading consumer is located, will likely keep them from going any higher in the near future. Other consumers of scrap are not interested in the market, and there would be no trouble to-day in buying the best grades of heavy steel scrap at \$16.25 to \$16.50 per gross ton, delivered at consumer's mill. We have advanced prices slightly on heavy steel scrap, and also on borings and turnings. Reports of sales of low phosphorus melting stock in this market at \$20.50 are not credited. Dealers are now quoting for delivery in the Pittsburgh and nearby districts that take the same rates of freight, per gross ton, as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$16.50 to \$16.75
No. 1 foundry cast	15.75 to 16.00
Rerolling rolls, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.50 to 16.75
Hydraulic compressed sheet scrap ..	14.50 to 14.75
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	12.50 to 12.75
Bundled sheet stamping scrap	11.50 to 11.75
No. 1 railroad malleable stock	14.00 to 14.25
Railroad grate bars	11.00 to 11.25
Low phosphorus melting stock	19.00 to 19.50
Iron car axles	25.50 to 26.00
Steel car axles	26.00 to 26.50
Locomotive axles, steel	28.00 to 28.50
No. 1 busheling scrap	13.25 to 13.50
Machine-shop turnings	8.50 to 8.75
Old carwheels	14.00 to 14.50
Cast-iron borings	8.50 to 8.75
*Sheet bar crop ends	16.00 to 16.50
No. 1 railroad wrought scrap	18.75 to 19.00
Heavy steel axle turnings	12.00 to 12.25
Heavy breakable cast scrap	13.50 to 13.75

*Shipping point.

Coke.—The hot weather has cut down very materially the output of coke and there is a scarcity of blast-furnace coke for prompt shipment. It readily brings \$2.75 per net ton at oven, several makers asking higher prices. About all the contracts for blast-furnace coke for delivery in last half of 1917 have been closed up, a recent one being for about 8000 tons per month for last half of the year for an Eastern furnace at about \$2.40 per net ton at oven. Furnace coke contracts for last half have ranged from \$2.35 to \$2.65 per net ton at oven. We quote prompt furnace coke at \$2.75 per net ton at oven, and on contracts from \$2.35 for some grades of coke up to \$2.65 for two or three makes that have a very high reputation in the trade for quality. We quote 72-hr. foundry coke at \$3 to \$3.25 for

prompt shipment and \$3.25 to \$3.50 on contracts for last half of the year. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended July at 423,550 tons, an increase over the previous week of about 6000 tons. The output for the week ended July 8 is expected to show a material falling off ± 3 compared with the output given above for the previous week.

Chicago

CHICAGO, ILL., July 10, 1916.

The activity of domestic consumers is again incidental and export demand the determining factor affecting the mill situation. However, no significant changes are to be noted in the Western market. Rails for export are still under consideration. There is some new inquiry for cars and some buying of locomotives. Structural projects appear to be more numerous, but are confined to undertakings of small size. Recent quotations on plates have brought out a decided variation in prices, with premiums obtainable only for the very prompt delivery. For shipment no later than September 2.90c., Pittsburgh, has been quoted, while for deliveries in July 4c., Pittsburgh, has been done on a fair tonnage. Prices for sheets appear not to have been bolstered up either by the higher wage scale or the higher-priced sheet bars which must be reckoned with in the third quarter. Interest on the part of users of soft steel bars indicates that some business could be done at a price of 2.50c., for deliveries up to six weeks. Dullness in rail carbon steel has resulted in some concessions to take business at competitive points. A little better inquiry is noted for pig iron and sales of malleable and Southern foundry iron in small quantity have been made. Sellers of scrap appear to have been able to force some advances on the strength of recent buying of steel for Gary and sales of rolling mill grades the early part of the week were at higher prices. The advance was not long supported, however, through lack of sustained buying.

Pig Iron.—The established inaction in the market is broken only by occasional transactions, the week bringing out one purchase of malleable from a local interest, the tonnage involved being of moderate size. Northern furnaces have not yet shown any concessions from the prices that have ruled for some time. Sales of Southern iron were made last week on the basis of \$14 for spot shipment from furnace and the same price for forward delivery of warrant iron. While it is understood that the larger part of the warrant iron, which has been undermining the strength of the Southern market, has been liquidated, enough remains to be a competitive element in such few transactions as are materializing. An inquiry for 500 to 1000 tons of Southern iron for delivery in central Illinois in the fourth and first quarters is reported, in which connection \$14.50 Birmingham has been quoted. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5.....	\$19.75
Lake Superior charcoal, No. 1.....	20.25
Lake Superior charcoal, No. 6 and Scotch....	20.75
Northern coke foundry, No. 1.....	19.50
Northern coke foundry, No. 2.....	19.00
Northern coke foundry, No. 3.....	18.50
Southern coke, No. 1 f'dry and 1 soft.....	\$18.50 to 19.00
Southern coke, No. 2 f'dry and 2 soft.....	18.00 to 18.50
Malleable Bessemer	19.50
Basic	19.00 to 19.50
Low phosphorus	34.00 to 36.00
Silvery, 8 per cent.....	31.50
Bessemer ferrosilicon, 10 per cent.....	33.50 to 35.50

Rails and Track Supplies.—About the only negotiations for new business in which the local mill is engaged are the several lots of rails for export, one or two of which were closed last week, resulting in the placing of some 5000 tons. The Burlington closed for 5000 tons of iron tie plates last week. While it is expected that a part of the recent Russian rail order

will be rolled at Chicago, no definite assignment of tonnage has as yet been made. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, \$50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, \$33, base; open-hearth, \$35; light rails, 25 to 45 lb., \$40; 16 to 20 lb., \$41; 12 lb., \$42; 8 lb., \$43; angle bars, 2c., Chicago.

Structural Material.—The Omaha Structural Steel Company will furnish about 370 tons of fabricated steel for the Great Western Sugar Company's warehouse at Denver, and the American Bridge Company has taken a 325-ton bridge for erection in Stanislaus county, Cal. A number of small jobs of less than 200 tons are also reported placed. There is little inquiry for cars, new proposals including 500 refrigerator cars for the Illinois Central Railroad, 300 sub-sills for the Northern Pacific and 100 gondolas for the Texas & Pacific railroad. The buying of locomotives continues, but these purchases are important in the aggregate rather than individually. The mill situation with respect to the availability of plain material is unchanged. One interest is still offering Bessemer shapes for last half contracts at 2.50c. We quote for Chicago delivery of structural steel from mill 2.689c.

We quote for Chicago delivery of structural steel from jobbers' stock 3.10c.

Rivets and Bolts.—Very little is offered in the way of new business in bolts and nuts, the trade being well covered for the third quarter. Manufacturers report specifications ample to sustain operations at full capacity. Rivets are selling at a wide range of prices, depending upon deliveries desired. For early shipment 3.60c., Pittsburgh, can be done, while for contracts 4c. is commonly quoted. We quote carriage bolts up to $\frac{3}{8}$ x 6 in., rolled thread, 50-10-5; cut thread, 50-5; larger sizes, 40-5; machine bolts up to $\frac{3}{8}$ x 4 in., rolled thread, with hot pressed square nuts, 50-10-10; cut thread, 50-10; larger sizes, 40-10-5; gimlet point coach screws, 60; hot pressed nuts, square, \$2.90 off per 100 lb.; hexagon, \$2.90 off. Structural rivets, $\frac{3}{4}$ to $1\frac{1}{4}$ -in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 3.50c.; boiler rivets, 3.60c.; machine bolts up to $\frac{3}{8}$ x 4 in., 60-10; larger sizes, 50-10; carriage bolts up to $\frac{3}{8}$ x 6 in., 60-5; larger sizes, 50 off; hot pressed nuts, square, \$3.25, and hexagon, \$3.25 off per 100 lb.; lag screws, 65.

Bars.—Recent heavy sales of Bessemer steel for export appear to have again restricted domestic offerings of Bessemer steel that have been appearing in various forms. For mild steel bars for delivery within six weeks, where 2.50c., Pittsburgh, had been generally quoted, 2.75c. is now being asked where the tonnage is of any size. The scarcity of rail carbon steel business is further shown by the keener competition in competitive territory, with the mills apparently willing to make the concessions necessary to secure the order. Under such circumstances 2.35c., f.o.b., mill, has been quoted. We quote, mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.689c.; nominal on contracts, 3.18c. for prompt shipment; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c. base with 5c. extra for twisting in sizes $\frac{1}{2}$ x 6 in. and over and usual card extras for smaller sizes; shafting 10 per cent above list.

Sheets.—The weakness in sheets persists, despite the higher wage scale for the third quarter and the higher schedule of prices for sheet bars. The number of mills under necessity of marketing their product in the face of a limited demand and lacking jobbing mills to enable them to put their steel into blue annealed sheets are the responsible factor in the situation. While open-hearth first quality sheets continue to demand 3c., Pittsburgh, Bessemer and high-carbon roofing sheets are selling at 2.90c. and down to 2.75c. Galvanized sheets show the influence of the declining spelter market, but demand does not appreciably improve. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.089c. to 3.339c.; box annealed, No. 17 and

lighter, 2.939c. to 3.039c.; No. 28 galvanized, 4.939c. to 5.039c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.10c. to 3.20c.; No. 28 galvanized, 5.40c. to 5.50c.

Plates.—How far conditions have changed in the direction of more favorable terms for the purchase of plates is not clearly established. One interest, which has solicited contracts for third quarter at 3.50c., finds little interest on the part of users and it is reported that a competitive bid of 2.90c., with delivery promised in September, failed to secure the business sought. For wide plates, to be delivered within the current month, 4c., Pittsburgh, was done last week, but another mill, asking the same price for third quarter, reports that it is taking practically no orders. We quote for Chicago delivery of plates from mill on contract 3.089c. and for prompt shipment 3.689c. to 4.189c.

We quote for Chicago delivery of plates out of jobbers' stock 3.50c.

Cast Iron Pipe.—Pipe companies are taking a very good miscellaneous tonnage, one order of 1100 tons being booked last week. There is also some railroad buying, including 150 tons for the Milwaukee road. For municipal purposes, buying is very limited, current inquiry including 250 tons for Lima, Ohio, 200 tons for Berwyn, Ill., and 130 tons of special pipe for St. Louis. We quote as follows, per net ton, Chicago: Water pipe, 4-in., \$33.50 to \$34; 6-in. and larger, \$30.50 to \$31, with \$1 extra for class A water pipe and gas pipe.

Wire Products.—The dull season in the domestic market, as usual, finds a minimum of sales activity in the farming districts. In the manufacturing trade there is still a scarcity and a sharp demand for rods. We quote as follows: Plain wire, Nos. 6 to 9, base, \$2.639; wire nails, \$2.689; painted barb wire, \$2.839; galvanized barb wire, \$3.539; polished staples, \$2.839; galvanized staples, \$3.539, all Chicago.

Old Material.—That the purchase of steel scrap for Gary, now known to have involved 30,000 tons, has not been entirely without a strengthening influence is shown in the slightly better prices asked for associated grades of scrap. No. 1 wrought is a little firmer and there is some demand for turnings and borings. Shoveling steel, which is accepted at Gary at the same price as heavy melting steel, is commanding 25c. to 50c. per ton more, and rerolling rails, which have been weak and are still very cheap as compared with the price of rail carbon bars, are firmer. Renewal of demand for steel axles for export has again jumped the price of that specialty to \$26. In the home market, discard billets, obtainable at \$28 a ton, are displacing axles for rolling mill use. Railroad offerings this week include 2000 tons from the Big Four, 1600 tons from the Milwaukee, 900 tons from the Omaha and 500 tons from the Monon railroad. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$18.50 to \$19.00
Relaying rails	19.50 to 20.50
Old carwheels	12.00 to 12.25
Old steel rails, rerolling	15.25 to 15.50
Old steel rails, less than 3 ft.	15.00 to 15.25
Heavy melting steel scrap	14.25 to 14.50
Frogs, switching and guards, cut apart	14.25 to 14.50
Shoveling steel	13.75 to 14.25
Steel axle turnings	9.25 to 9.75
Per Net Ton	
Iron angles and splice bars	\$18.25 to \$18.75
Iron arch bars and transoms	19.50 to 20.00
Steel angle bars	13.50 to 14.00
Iron car axles	25.50 to 26.25
Steel car axles	25.75 to 26.25
No. 1 railroad wrought	14.25 to 14.50
No. 2 railroad wrought	14.00 to 14.25
Cut forge	14.00 to 14.25
Pipes and flues	10.50 to 10.75
No. 1 busheling	12.00 to 12.50
No. 2 busheling	8.50 to 9.00
Steel knuckles and couplers	13.50 to 14.00
Steel springs	14.00 to 14.50
No. 1 boilers, cut to sheets and rings	9.25 to 9.75
Boiler punchings	13.50 to 14.00
Locomotive tires, smooth	20.00 to 20.50
Machine shop turnings	5.50 to 6.00
Cast borings	5.75 to 6.25
No. 1 cast scrap	11.50 to 12.00
Stove plate and light cast scrap	9.25 to 9.75
Grate bars	10.00 to 10.25
Brake shoes	9.75 to 10.25
Railroad malleable	11.75 to 12.25
Agricultural malleable	10.75 to 11.25

Philadelphia

PHILADELPHIA, PA., July 11, 1916.

Unquestionably there is a feeling on the part of consumers of steel products that keeping out of the market as much as possible will redound to their profit. They believe that by holding off they will be able to secure materials needed in the future at lower prices. Consequently, there is less tendency to contract. With the mills filled as they are, however, most producers regard the slackening of new business as a welcome relief. Some good-sized sales of rerolling billets have been made at \$45, which is less than Eastern makers have been asking. In plates and shapes the spread of quotations is notable, and indicates that some mills are more anxious to take orders than others. The plates situation is the strongest of any, probably due to the demand from shipyards, both old and newly established. Structural shapes are quiet, so far as new business is concerned, labor difficulties tending to add to the dullness. The domestic demand for pig iron is lagging, but the market for low phosphorus for export is growing in activity. Old materials continue quiet owing to lack of interest on the part of the mills. Consumers appear to be little interested in ferromanganese.

Pig Iron.—Except for export inquiry, with increasing consequent sales, the market is dull. Italy is the chief purchaser, and is specifying for the most part iron containing 0.035 to 0.040 phosphorus for which \$34 to \$35, seaboard, is being paid. The anxiety to get the iron is indicated by a change of front by the buyers in respect to terms. Heretofore they have asked that these be c.i.f., Genoa, but now they are willing, at least in some cases, to pay cash, New York, on presentation of shipping documents, providing the weight and analyses have been attested. A shipment of Lebanon low-phosphorus is en route to Italy, and several thousand tons of non-copper bearing low-phosphorus has been contracted for. A sale of about 3000 tons has been made to a Canadian interest. The domestic demand for all grades is light, but deliveries are going forward at a good rate, and any delay in shipments is generally productive of immediate protest. An eastern Pennsylvania steel company has closed for 4000 tons of basic, for which about \$19, delivered, was paid. Some sellers of basic continue to ask \$20, Philadelphia. In foundry iron very little is doing, although one important agent reports that small inquiries have been slightly more numerous than in the preceding week. The larger producers are disposed to hold to their prices, leaving the granting of concessions to the smaller furnaces whose orders are rather lean. These smaller makers are making the market to a considerable extent, and are quoting \$19 or less at furnace. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa., No. 2 X foundry	\$19.75 to \$20.25
Eastern Pa., No. 2 plain	19.50 to 20.00
Virginia, No. 2 X foundry	21.25
Virginia, No. 2 plain	20.75
Gray forge	18.50 to 19.00
Basic	19.00 to 19.50
Standard low phosphorus	33.00 to 34.00

Iron Ore.—In the week ended July 8 there were no arrivals of foreign ore at this port.

Ferroalloys.—The market for 80 per cent ferromanganese is quiet and easy. For prompt, \$175, seaboard, would be considered by importers and domestic makers, though the quantity of spot material is limited. The arrival, last week, of 600 tons of English ferromanganese is reported by the customs authorities. Prompt spiegeleisen can be had at \$50, furnace. Contract ferrosilicon, 50 per cent, is unchanged at \$83 to \$85, Pittsburgh, according to quantity, and 11 per cent at \$35.44.

Plates.—Quotations have a wider spread, but otherwise the situation is but little changed. Two large producers adhere to 4.159c., Philadelphia, as their minimum. One of these mills sees business enough to keep it busy until April next, taking into consideration the normal needs of regular customers. It continues to quote, and to get, 5.50c., mill, for such small lots as it

can squeeze out for prompt delivery. Another maker quotes 3.659c., Philadelphia, and would shade this price under some circumstances. The requirements of the shipyards lead the demand. Locomotive work is less active.

Bars.—Bessemer bars are unchanged at 2.659c., Philadelphia, and open-hearth bars are obtainable at about 2.909c. Two or three large bar makers are still out of the market. Iron bars are somewhat quieter, with the quotation unchanged at 2.659c., Philadelphia.

Structural Material.—Practically no new business worthy of note is coming out, and prices show a spread of at least ½c. One mill quotes 2.659c., Philadelphia, another 2.909c., and another 3.159c. Three conditions are mentioned as contributory to the inactivity, one of which is labor trouble. The local structural iron workers have made a demand for 68½c. per hour instead of 60c. Then there are the prevailing cost of material and the difficulty in getting prompt shipments.

Billets.—A fair-sized tonnage of open-hearth re-rolling billets have been contracted for at \$45, indicating an easier market for this district. Forging steel is unchanged at \$65.

Sheets.—Premiums on blue annealed are disappearing, and No. 10 can be had for 3.659c., Philadelphia, prompt delivery. On contracts close to 3.159c. can be done.

Coke.—Furnace coke on contracts is being freely offered at \$2.50, but not much is doing. Prompt furnace is quoted at \$2.75 per net ton at oven. Prompt foundry is quoted at \$3.25 to \$3.50 per net ton at oven, and contract foundry at \$3.50. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

Old Material.—The mills are doing nothing and the market drags, although the recent buying at Pittsburgh imparted a better feeling to the trade. Brokers who are short have offered up to \$15.75 for heavy melting steel. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$15.00 to \$15.50
Old steel rails, rerolling.....	17.00 to 18.00
Low phos. heavy melting steel scrap	20.50 to 21.50
Old steel axles.....	26.00 to 27.00
Old iron axles.....	28.00 to 29.00
Old iron rails.....	20.00 to 20.50
Old carwheels.....	16.00 to 16.50
No. 1 railroad wrought.....	19.50 to 20.00
Wrought-iron pipe.....	12.50 to 13.00
No. 1 forge fire.....	13.00 to 13.50
Bundled sheets.....	13.00 to 13.50
No. 2 busheling.....	10.50 to 11.00
Machine shop turnings.....	8.50 to 9.00
Cast borings.....	10.00 to 10.50
No. 1 cast.....	16.00 to 16.50
Grate bars, railroad.....	11.75 to 12.25
Stove plate.....	11.75 to 12.25
Railroad malleable.....	13.50 to 14.00

Cincinnati

CINCINNATI, OHIO, July 12, 1916.—(By Telegraph.)

Pig Iron.—A few inquiries have come to light that are mainly for small tonnages and the majority of these is said to be from consumers who wish to keep in touch with the market. A sale of approximately 2000 tons of Southern iron and 1500 tons of Northern foundry was made to an Ohio consumer for this year's shipment, this being the largest transaction reported. It is stated on good authority that nearly all of the re-sale iron of the Southern Ohio iron is now off the market and the furnaces there are quoting \$19, Iron-ton, for any shipment to July, 1917. Competition from different sources makes it difficult to establish this price. Southern foundry iron may be said to be a trifle firmer, as speculative iron in that district has been absorbed to an extent. Furnace iron is quoted all the way from \$14 to \$15, Birmingham basis. No firm offers on warrant iron have been reported lately, and the price at which some of this iron has changed hands lately is problematical. The consumption of foundry iron here is a little off, due principally to the hot weather, and in a few cases requests to hold up shipments on contracts have been made. Southern foundry iron stocks are slowly but steadily on the increase.

A report that the Virginia furnaces were quietly trying to invade this market is without foundation; the present difference in delivered costs with other districts should set this rumor at rest. No business of note is reported in the Ohio silvery irons and the low prices in the South have not induced buyers in this territory to contract ahead. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Iron-ton, we quote, f.o.b., Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.....	\$17.40 to \$18.40
Southern coke, No. 2 f'dry and 2 soft.....	16.90 to 17.90
Southern coke, No. 3 foundry.....	16.40 to 17.40
Southern coke, No. 4 foundry.....	15.90 to 16.90
Southern gray forge.....	15.40 to 16.40
Ohio silvery, 8 per cent silicon.....	28.26 to 28.76
Southern Ohio coke, No. 1.....	20.76 to 21.26
Southern Ohio coke, No. 2.....	19.76 to 20.26
Southern Ohio coke, No. 3.....	19.26 to 19.76
Southern Ohio malleable Bessemer.....	19.76 to 20.26
Basic, Northern.....	19.76 to 20.26
Lake Superior charcoal.....	21.20 to 22.20
Standard Southern carwheel.....	24.90 to 25.40

(By Mail)

Finished Material.—A slight improvement is noted in the warehouse business but mainly confined to specialties, such as reinforcing concrete bars, wire nails and blue annealed sheets. No changes have been made, and we quote from stock as follows: No. 10 blue annealed sheets at 3.50c.; steel bars and small structural shapes 3.20c.; wire nails, \$2.75 per keg base; barb wire, \$3.60 per 100 lbs.; plates, 3.50c.; smaller sizes machine bolts, 60 per cent off list; larger sizes, 40 and 10 and 5 per cent off list; hot pressed square and hexagon nuts, 2.70c. off list; malleable washers, 5½c. per lb.; cast iron washers, 3c. per lb., and cold rolled rounds 10 per cent plus list. A little better demand is noted for galvanized sheets. No. 28 galvanized sheets are quoted at 4.90c., f.o.b. Cincinnati or Newport, Ky., and No. 28 black sheets around 3c. to 3.10c.

Coke.—Contracting for both furnace and foundry coke is at a standstill. The foundries here have bought ahead and there is practically little demand from any source even for carload lots to fill in. Weather conditions and a shortage in labor are said to be retarding factors in the production in the three fields here, but as far as is known no premiums have been obtained for spot shipment coke in this territory. We quote Connellsville 48-hr. coke from \$2.25 to \$2.50 per net ton at oven, for nearby shipment, and as high as \$2.65 per net ton at oven on contract business. Foundry coke in the Connellsville, Wise County and Pocahontas fields are from \$3.25 to \$3.75 and New River foundry coke is unchanged at \$4.

Old Material.—The market is in a somewhat disturbed condition and the absence of general buying renders it difficult to arrive at average selling prices. On firm offers and for prompt shipment regular quoted prices can be shaded, in some cases as much as \$1 a ton, it is said. Sellers of scrap are holding back, anticipating a recovery in values. The following are dealers' prices to consumers, f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton	
Bundled sheet scrap.....	\$11.25 to \$11.75
Old iron rails.....	15.50 to 16.00
Relaying rails, 50 lb. and up.....	21.00 to 21.50
Re-rolling steel rails.....	14.50 to 15.00
Heavy melting steel scrap.....	14.00 to 14.50
Steel rails for melting.....	13.00 to 13.50
Per Net Ton	
No. 1 railroad wrought.....	\$13.25 to \$13.75
Cast borings.....	4.75 to 5.25
Steel turnings.....	5.25 to 5.75
Railroad cast scrap.....	11.00 to 11.50
No. 1 machinery cast scrap.....	12.75 to 13.25
Burnt scrap.....	8.25 to 8.75
Iron axles.....	21.00 to 22.00
Locomotive tires (smooth inside).....	19.50 to 20.00
Pipes and flues.....	9.50 to 10.00
Malleable and steel scrap.....	10.75 to 11.25
Railroad tank and sheet scrap.....	8.50 to 9.00

The Sulphide Corporation (British) has been allowed to retain half of the excess profits earned from the sale of spelter, and the works at Seaton Carew, of the Central Zinc Company, controlled by the Sulphide Corporation, are to be doubled. The enlargement of the works will enable the company to treat 30,000 tons of zinc concentrates per year. The Central Zinc Company was formed in 1906 by the Sulphide Corporation to provide a British outlet for part of the zinc concentrates from Broken Hill, Australia, so as no longer to be entirely in the hands of German buyers.

Cleveland

CLEVELAND, OHIO, July 11, 1916.

Iron Ore.—The strike situation on the Mesaba range appears to have improved, in that there has been no further spread of the trouble and some men have returned to work. However, operations in underground mines are practically suspended. The Steel Corporation appears to be making up for this loss by increased shipments from its open pit properties, but independent mining companies that confine their operations wholly or largely to underground mines are unable to do this. Labor is reported to have left the range in train loads to seek employment elsewhere and a considerable shortage in the labor supply is probable when the strike ends. There is a possibility of a shortage of Bessemer ore because of the tying up of the Mesaba underground mines. While it may be possible to keep up the tonnage from this range by increasing the output of the open pits, these are not able to supply the deficiency in the Bessemer output of the underground mines. The European demand for Bessemer pig iron has caused considerable increase in the demand for Bessemer ore, and some furnaces that had covered with ore requirements for other grades have had their ore contracts switched to Bessemer. There were large stockpiles of Bessemer ore on the old range early in the season, but as a result of the late demand these are said to have been well cleaned up. Some of the old range mines have not sold their entire Bessemer output for the season, but in view of the vessel and labor situation will probably be unwilling to take on additional contracts at the present time. More furnaces would doubtless run on Bessemer iron were they able to change their ore contracts to Bessemer grades. We quote prices as follows, delivered lower lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; Old range Bessemer, \$3.70; Mesaba non-Bessemer, \$3.55.

Pig Iron.—A Cleveland interest has sold 20,000 tons of Bessemer iron for shipment to Italy from its Valley furnace during third quarter at \$21.50. The United Steel Company, Canton, Ohio, has purchased a round lot of basic iron for the last half. This iron, or at least the greater part of it, will be furnished by a Cleveland furnace. The market is dull, with the exception of the foreign demand for Bessemer iron, for which considerable inquiry continues to come out. The Struthers Furnace Company expects to blow in within a week its stack at Struthers, Ohio, which has been out for relining and repairs. This furnace, which usually produces basic iron, will run on Bessemer. The local price on foundry grades is unchanged at \$18.50, at furnace, for No. 2. Furnace prices on Southern iron for early shipment are somewhat easier, No. 2 being offered at \$14, Birmingham, for prompt shipment and third quarter. Quotations are \$14.50 for the fourth quarter and \$14.50 to \$15 for first half. It is claimed that Southern resale iron that has been offered at \$14 or less has been mostly cleaned up. We quote delivered Cleveland as follows:

Bessemer	\$21.95
Basic	18.95
Northern No. 2 foundry	\$18.70 to 19.00
Southern No. 2 foundry	18.00 to 18.50
Gray forge	18.50
Jackson Co. silvery, 8 per cent. silicon	28.62 to 30.62
Standard low phos. Valley furnace	32.00

Coke.—The market continues very dull. Standard Connellsville foundry coke is quoted at \$3 to \$3.25, per net ton at oven, for prompt shipment and \$3.25 to \$3.50 for contracts. Furnace coke is held at \$2.70 for prompt shipment.

Finished Iron and Steel.—Specifications continue fairly good, but new demand for finished steel has quieted down somewhat, with the exception of plates, the call for which continues heavy. Considerable plate business for rather early delivery is being placed at 4c., Pittsburgh, some coming from consumers who have been holding off in the expectation of lower prices. Plate quotations range from 3.50c. to 4c., Pittsburgh. Some contracts are being closed at 2.50c., Pittsburgh, for steel bars and 2.50c. to 2.75c. for structural material for the third quarter. There is little new demand for

steel for building work, but some stock orders are coming from fabricators. Alloy steels are in good demand and several inquiries for nickel steel, aggregating over 5000 tons, are pending from automobile manufacturers. There is a fair demand for bar iron, and an Ohio manufacturer has taken 1000 tons on the basis of 2.36c., Chicago mill. The local price is unchanged at 2.50c., Cleveland. A Cleveland mill has just closed for its sheet bar requirements for the third quarter. Galvanized sheets have declined to 4.40c., at mill, for No. 28, owing to lower spelter prices. There is considerable inquiry, but, with the falling prices, buying is only in small lots for immediate needs. Mills look for a heavy demand when the prices become staple. Black and blue annealed sheets are in fair demand, with prices unchanged at 2.90c. to 3c. for No. 28 and 3c. to 3.25c. for blue annealed. We quote warehouse prices at 3.25c. for steel bars and structural material, 3.65c. for plates and 3.20c. for iron bars.

Bolts, Nuts and Rivets.—The new demand for bolts and nuts has fallen off, but specifications are heavy. Mill prices are firm, but some of the jobbers with large stocks are making price concessions. There is a good demand for rivet contracts for the last half, which are being made at regular prices, but specifications are not as heavy as they have been. We quote rivets at 4c., Pittsburgh, for structural and 4.10c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, $\frac{3}{4}$ x 6 in., smaller or shorter, rolled thread, 50 and 10; cut thread, 50; larger or longer, 40; machine bolts with h. p. nuts, $\frac{3}{4}$ x 4 in., smaller and shorter, rolled thread, 50, 10 and 5; cut thread, 50 and 5; larger and longer, 40 and 10; lag bolts, gimlet or cone point, 50 and 10; square h. p. nuts, blank or tapped, \$2.90 off the list; hexagon, h. p. nuts, blank or tapped, \$2.90 off; c. p. c. and t. square nuts, blank or tapped, \$2.60; hexagon nuts, all sizes, \$3 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 10.

Old Material.—Local prices on heavy melting steel have advanced fully 50c. a ton as a result of the heavy buying by the leading interest. Cleveland dealers are understood to have sold about 20,000 tons of melting steel scrap for shipment to Munhall at \$16 to \$16.50, delivered, which is equivalent to about \$14.75, delivered to local mills. Car wheels are firmer as a result of some new demand, but prices on other grades except old steel rails have not been affected. All mills are now taking shipments of heavy melting steel scrap freely, and dealers have been given shipping orders on round tonnages sold some time ago at higher prices. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Steel rails	\$14.75 to \$15.00
Iron rails	18.50 to 19.00
Steel car axles	28.00 to 29.00
Heavy melting steel	14.75 to 15.00
Car wheels	12.75 to 13.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	12.50 to 12.75
Railroad malleable	14.00 to 14.25
Steel axle turnings	12.00 to 12.25
Light bundled sheet scrap	12.00 to 12.25

Per Net Ton	
Iron car axles	\$23.00 to \$24.00
Cast borings	5.75 to 6.00
Iron and steel turnings and drillings	5.75 to 6.00
No. 1 bushing	11.00 to 11.50
No. 1 railroad wrought (nominal)	15.00 to 15.50
No. 1 cast	14.00 to 14.25
Railroad grate bars	9.00 to 9.50
Stove plate	10.00 to 10.25

Birmingham

BIRMINGHAM, ALA., July 10, 1916.

Pig Iron.—There has been little or no change in the stagnant condition, excepting a more brisk inquiry which has lately sprung up, without, however, producing an appreciable amount of business. The most reassuring feature is that stocks have not increased to any extent. June was as gratifying as May in this respect. Considering that the manufacture of iron has been on a record-breaking basis for nine months, the almost even break between make and movements during the stagnant period has been a source of optimism. Quotations of \$15.50 for the last half and first half of next year on a round lot did not bring the business. Makers, as a rule, quote \$15 for the remainder of the year, and that price is the basis of the usual small order that comes in for fill-in purposes. Southern foundry makers

are banking somewhat on the expected scarcity of Lake ores and the large demand for basic. No activity is expected for a month to come. The Woodward Iron Company is operating its five stacks, one on basic. A stack that was blown out in June resumed after relining in 22 days. Other furnace operators show a like disposition to continue the maximum output. Operations in furnaces, steel mills and rolling mill plants were considerably hampered during the holiday week by high water caused by the excessive rainfall. There has been talk of \$14 furnace iron coming this way from competitive fields, but there is no evidence of any such transaction in Birmingham. We quote per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft.....	\$15.25 to \$15.50
No. 2 foundry and soft.....	14.50 to 14.75
No. 3 foundry.....	14.25 to 14.50
No. 4 foundry.....	14.00 to 14.25
Gray forge.....	13.75 to 14.00
Basic.....	15.00 to 15.25
Charcoal.....	22.00 to 22.50

Cast-Iron Pipe.—The pipe market is dull, but gas and waterpipe foundries had good orders on books before the lull set in. Operations continue at the pace of the past several months. We quote, per net ton, f.o.b. pipe-shop yards, as follows: 4-in., \$28; 6-in. and upward, \$25, with \$1 added for gas pipe and 16-ft. lengths.

Coal and Coke.—The coal trade has rallied somewhat owing to contract renewals, larger takings by the railroads and the stocking of domestic yards. The river business has been a heavy sufferer from the gulf storms and heavy rainfall all over Alabama. The Pratt Consolidated lost a steamer and two barges on the Warrior River. Prices rule a little higher than last year owing to less keenness of competition. The demand for coke is insistent and the supply for the open market is small. The ruling price for standard beehive foundry is \$4.25 to \$4.50 and for furnace coke \$3.25 to \$3.50.

Old Material.—It is believed that old material has reached rock-bottom and that in a short time, owing to large consumption, advances will set in; but it is still soft. Foundries are using a large amount of scrap in place of pig iron on account of the price. Even lower levels have been marked in some instances. We quote, per gross ton, f.o.b. Birmingham dealers' yards, as follows:

Old steel axles.....	\$22.00 to \$23.00
Old steel rails.....	10.00 to 10.50
No. 1 steel scrap.....	9.00 to 9.50
No. 1 wrought scrap.....	12.50 to 13.00
No. 1 cast scrap.....	10.50 to 11.00
Extra heavy cast scrap.....	9.50 to 10.00
Stove plate and light.....	9.00 to 9.50
Old carwheels.....	9.50 to 10.00
Tram carwheels.....	9.50 to 10.00

Buffalo

BUFFALO, N. Y., July 11, 1916.

Pig Iron.—Although, generally speaking, the market is showing midsummer quiet, some furnaces report slightly increased inquiry for the week, principally in 200 to 500-ton lots. The total of orders placed was somewhat larger than for two or three weeks past, aggregating about 10,000 tons of all grades, including an order for 3000 tons of basic and another of a smaller amount of basic. Furnacemen have orders in hand covering capacity for a long period ahead and are centering their efforts on shipping out product—shipments being limited only by railroad equipment obtainable and mechanical and man power for loading. With no change in prices, we quote as follows for last half delivery, f.o.b. furnace, Buffalo:

No. 1 foundry.....	\$19.00 to \$19.50
No. 2 X foundry.....	18.50 to 19.50
No. 2 plain.....	18.50 to 19.00
No. 3 foundry.....	18.50 to 18.75
Gray forge.....	18.50
Malleable.....	18.50 to 19.50
Basic.....	19.50 to 20.00
Bessemer.....	21.00 to 22.00
Charcoal, regular brands and analysis.....	21.00 to 22.00

Finished Iron and Steel.—Specifications are coming along against contracts closed earlier in the year; but because of inability of most of the larger mills to make shipment short of the first quarter of next year, the

buying is for relatively prompt shipment from smaller mills, which seem to be reducing their premium prices to a basis more nearly in line with those of the large mills. The consumption of steel seems to be fully as great as at any time in the past several months. All of the machine shops in this territory are well filled up with work for months ahead and there are no indications of abatement in the volume of business they are receiving. Warehouse prices have been reduced slightly, bars under 2-in. and structural shapes now ruling at 3.25c. base; bars 2-in. and larger, 3.90c., and plates, 4c., all delivered Buffalo. Bids are being taken for structural steel for factory and machine shop to be erected by the C. A. Simons Machine Company, Albany, about 100 tons. The Buffalo Structural Steel Company has a contract for 350 tons for the Pomeroy & Wright store and office building, Buffalo; the Kellogg Structural Steel Company, a contract for steel for St. Bonaventure College, Olean, N. Y., 100 tons, and the Lackawanna Bridge Company an order for a small tonnage for machinery and pipe supports at the new coke oven plant of the Semet Solvay Company, Buffalo.

Old Material.—The market is firmer than a week ago and freer buying of some commodities has tended to strengthen it all along the line. This firmer tendency is based principally on good-sized sales of heavy melting steel for shipment to points outside of this district. An optimistic feeling prevails that conditions will continue to grow better, although prices are not expected to advance materially in the near future. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.....	\$15.50 to \$16.00
Low phosphorus steel.....	20.00 to 20.50
No. 1 railroad wrought scrap.....	17.25 to 17.75
No. 1 railroad and machinery cast scrap.....	15.50 to 16.00
Steel axles.....	24.00 to 24.50
Iron axles.....	24.00 to 24.50
Carwheels.....	13.00 to 13.50
Railroad malleable.....	15.00 to 15.50
Machine shop turnings.....	6.25 to 6.75
Heavy axle turnings.....	12.00
Clean cast borings.....	7.25 to 7.75
Iron rails.....	18.00 to 18.50
Locomotive grate bars.....	11.50 to 12.00
Stove plate (net ton).....	11.00 to 11.50
Wrought pipe.....	12.00 to 12.50
Bundled sheet scrap.....	11.50 to 12.00
No. 1 busheling.....	13.00 to 13.50
No. 2 busheling.....	11.00 to 11.50
Bundled tin scrap.....	15.00 to 15.50

St. Louis

ST. LOUIS, Mo., July 10, 1916.

Pig Iron.—Resale iron offered has unsettled the market. Consumers do not need material and are inclined to wait further developments. Furnace representatives maintain that there is not enough resale iron to worry about and no occasion to reduce prices. Transactions have been entirely in small lots for immediate needs.

Coke.—No large transactions in coke have taken place and the 36,000-ton furnace coke inquiry is still pending.

Finished Iron and Steel.—Finished products are quiet, but specifications are fully up to contract allotments, while consumers' yards are reported as provided only with the necessary stock ahead. Movement out of warehouse continues practically up to capacity. We quote for stock out of warehouse as follows: Soft steel bars, 3.15c; soft iron bars, 3.05c; structural material, 3.15c; tank plates, 3.55c; No. 10 blue annealed sheets, 3.45c; No. 28 black sheets, cold rolled, one pass, 3.30c; No. 28 galvanized sheets, black sheet gage, 5.10c to 5.40c, according to quantities and delivery, being largely affected by spelter conditions and prices.

Old Material.—There has been no trading except a little among the dealers. All the local industries are refusing to buy and most of them are either refusing to receive material or are making it so hard to effect delivery that the same result is accomplished. No relaying rails are being offered, and the inquiries, especially for light section rails, are pressing the dealers. Lists out during the week include these: The Wabash, 4000 tons; Missouri, Kansas & Texas, 2000 tons; Chicago, Peoria & St. Louis, 300 tons; Kansas

City Southern, 300 tons; Union Pacific, 2000 tons; Southern Railway, 3000 tons; Chicago, St. Paul, Minneapolis & Omaha, 1000 tons; St. Louis Southwestern, 300 tons, and some minor lots from local industries. Quotations are largely nominal. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district as follows:

Per Gross Ton	
Old iron rails	\$15.75 to \$16.25
Old steel rails, rerolling	15.00 to 15.50
Old steel rails, less than 3 ft.	15.75 to 16.25
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	11.25 to 11.75
No. 1 railroad heavy melting steel scrap	14.00 to 14.50
Heavy shoveling steel	12.00 to 12.50
Frogs, switches and guards cut apart	14.00 to 14.50
Bundled sheet scrap	8.00 to 8.50

Per Net Ton	
Iron angle bars	\$15.25 to \$15.75
Steel angle bars	12.75 to 13.25
Iron car axles	22.00 to 22.50
Steel car axles	25.00 to 25.50
Wrought arch bars and transoms	18.50 to 19.00
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	13.75 to 14.25
Railroad springs	13.25 to 13.75
Steel couplers and knuckles	13.25 to 13.75
Locomotive tires, 42 in. and over, smooth inside	19.00 to 19.50
No. 1 dealers' forge	10.25 to 10.75
Cast iron borings	5.75 to 6.25
No. 1 busheling	11.50 to 12.00
No. 1 boilers, cut to sheets and rings	8.00 to 8.50
No. 1 railroad cast scrap	10.50 to 11.00
Stove plate and light cast scrap	8.25 to 8.75
Railroad malleable	10.50 to 11.00
Agricultural malleable	9.50 to 10.00
Pipes and flues	9.50 to 10.00
Railroad sheet and tank scrap	9.00 to 9.50
Railroad grate bars	8.25 to 8.75
Machine shop turnings	6.75 to 7.00

New York

NEW YORK, July 12, 1916.

Pig Iron.—The New York pig iron trade is more occupied in figuring out how much Bessemer iron has been taken for Italy than with domestic inquiries for foundries or any other kind of iron. A Central Pennsylvania furnace will go on to Bessemer to fill an order for 10,000 tons for export, at a price considerably better than the present level for foundry iron. A western Pennsylvania furnace has taken 4000 tons of standard Bessemer for Italy and another furnace has closed for 2000 tons, in which the phosphorus requirement is 0.06 per cent. The purchases for Holland amount to at least 2500 tons, one lot of 1500 tons and another of 1000 tons. Some of this iron was high silicon, high phosphorus and high manganese, 3.50 per cent of manganese being asked for. There has been some export inquiry for high phosphorus basic iron—phosphorus up to 1.50 per cent—and France recently asked for Bessemer iron with silicon 2 per cent or upward. The melt of foundry iron continues light on account of foundry labor shortage and strikes at a number of foundries. Foundrymen seem to be in no need of pig iron and the market may drift as at present through the summer. The low prices of Southern resale iron and of warrants still have an unfavorable effect on the general market. We quote at tidewater for early delivery: No. 1 foundry, \$20.50 to \$21; No. 2X, \$19.75 to \$20.25; No. 2 plain, \$19.50 to \$20; Southern iron at tidewater, \$20 to \$20.50 for No. 1 and \$19.50 to \$20 for No. 2 foundry and No. 2 soft.

Ferroalloys.—Ferromanganese is obtainable now for any delivery up to the end of 1917 at \$175, seaboard, but demand is insignificant. Early in April spot material was selling at \$450 per ton. One or two steel companies are inquiring for a few hundred tons for early delivery because of a larger consumption than originally provided for by contracts. The Government has bought for the Brooklyn and Washington navy yards 15,000 and 10,000 lb., respectively, for consumption in converter steel casting plants. Press reports have given these figures as tons instead of pounds. Export inquiry amounts to several thousand tons, but no sales have resulted. Arrivals from England are fully equal to the rate maintained for the first five months of this year; a large cargo is expected this

month by special steamer for delivery to large consumers on contract. Spiegeleisen is quiet at \$50, furnace, on contract. A sale to Italy of 500 tons is reported at the prevailing quotation. Ferrosilicon, 50 per cent, is strong and specifications on contract very active.

Finished Iron and Steel.—Chief interest continues to lie in export business, with the closing for upward of 450,000 tons of rails for Russia occupying the leading place. Plate inquiries are frequent, many, however, representing the one buyer with different brokers striving to complete the deal. One large offering in bars comprises 30,000 tons of $\frac{3}{4}$ -in. size and smaller. In domestic business the structural field is dull. It is expected that the report of the Bridge Builders and Structural Society will show a marked falling off from May for the tonnage of fabricated steel work put under contract in June. About the only large job closed since last week's review covers 1200 tons for the General Chemical Company at Marcus Hook, Delaware County, Pa., awarded to the Hedden Iron Construction Company. Innumerable projects have been planned and where necessary layouts have been filed, but general building material and labor costs are regarded as too high to push the work at the present time. In railroad cars a few new feelers have been put out, as by the Delaware & Hudson for coal cars and the Baltimore & Ohio for box cars, but no immediate business is expected, also because of high prices. Owing to the building and car situation, universal plates are not hard to get, but sheared plates are scarce at less than 4c., Pittsburgh, and small lots for prompt delivery command 5c. regularly, when warehouses cannot supply the size. Bessemer steel bars are obtainable for fairly prompt shipment at 2.50c., Pittsburgh. A large tonnage of spikes will, of course, be needed for the Russian rails and at least one of the rail makers will not supply the track accessories. We quote mill shipments of plain structural material at 2.669c. to 2.919c., New York; steel plates at 2.919c. to 4.169c., New York, according to the time of delivery, with universal plates at 3.669c. to 3.919c.; steel bars at 2.669c. to 2.919c., and iron bars at 2.669c. New York. Out of warehouse, we quote iron and steel bars and structural material at 3.10c. to 3.30c., New York, and plates at 4c. to 4.25c.

Cast Iron Pipe.—Bids were taken July 12 for a pipe-laying job for Perth Amboy, N. J., involving 15,320 ft. of 30-in. pipe, 11,000 ft. of class B and the remainder of class C pipe and totaling about 2700 tons. Prices are unchanged and carload lots of 6-in., class B and heavier, are quoted at \$30.50 per net ton, tide-water, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—The recent heavy buying for Pittsburgh has had no effect on scrap prices. Indeed, the few transactions noted in the past week were not calculated to point to a stiffening in quotations. In the case of borings and turnings a marked drop must be registered, owing to the increasing quantities available. Brokers quote buying prices about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	\$11.75 to \$12.25
Old steel rails (short lengths) or equivalent	12.75 to 13.25
Relaying rails	28.00 to 30.00
Rerolling rails	15.50 to 16.00
Iron car axles	26.00 to 27.00
Steel car axles (for domestic use)	28.50 to 29.00
Steel car axles (for export)	30.00 to 31.00
No. 1 railroad wrought	18.00 to 18.50
Wrought-iron track scrap	15.00 to 15.50
No. 1 yard wrought, long	14.50 to 15.00
No. 1 yard wrought, short	11.75 to 12.25
Light iron (nominal)	5.00
Cast borings (clean)	7.50 to 7.75
Machine shop turnings (nominal)	5.00 to 5.50
Mixed borings and turnings	4.50 to 5.00
Wrought pipe	10.00 to 10.50
Old carwheels (nominal)	15.00 to 15.50
Malleable cast (railroad)	12.25 to 12.75

Foundries are not buying. In some cases, with reduced operations, partly on account of labor conditions, cars are piled up awaiting unloading. Some inquiry from abroad, notably Italy, is noted, but the specifications are indefinite and the buyer needs a representative to secure desired co-operation from the dealers.

Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery).....	\$16.00
No. 2 cast (heavy).....	15.00
Stove plate	12.00
Locomotive grate bars	12.00

British Steel Market

Better Inquiry for American Billets—Large Cast Iron Pipe Order to Argentina

(By Cable.)

LONDON, ENGLAND, July 12, 1916.

Pig iron is quieter and consumers are well covered. Export business is narrow and licenses, except for shipment to France, are difficult to obtain. There is a better inquiry for American billets. Tin plates are depressed at 29s. to 30s. Argentina has booked 26,000 tons of cast-iron pipe with British foundries. Quotations, mostly nominal, are as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f. o. b. Wales, 29s. to 30s., against 33s. to 35s. a week ago.
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20, compared with £20 5s. last week.
Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.
Steel rails, export, f.o.b. works port, £10 17s. 6d.
Hematite pig iron, f.o.b. Tees, about 140s.
Sheet bars (Welsh) delivered at works in Swansea Valley, £14 10s., against £14 5s. a week ago.
Steel bars, export, f.o.b. Clyde, £18 5s.
Ferromanganese, £35 nominal.
Ferrosilicon, 50 per cent, c.i.f., £29.

Iron and Industrial Stocks

NEW YORK, July 12, 1916.

Some liquidation appeared in industrial stocks in the past week, due in part to higher rates for money, but more apparently to the fact that the market is now drifting with no stimulus from announcements of new munitions orders. The United States Steel Corporation's statement of unfilled orders, showing a falling off of nearly 300,000 tons, had some part in the decline.

Allis-Chal., com..	19 3/4 - 23 3/4	Ry. Stl. Spring,	
Allis-Chal., pref.	70 1/4 - 76 1/4	pref.	97
Am. Can. com...	51 1/2 - 55 1/4	Republic, com...	43 1/4 - 46
Am. Can. pref...	108 3/4 - 109 1/2	Republic, pref...	107 1/2 - 108
Am. Car & Fdy.,		Sloss, com.	45 - 47 1/2
com.	52 - 54 1/2	Sloss, pref.	95 3/4
Am. Car & Fdy.,		Pipe, com.	19 - 22 1/4
pref.	115 1/2 - 116 1/4	Pipe, pref.	52 1/4 - 53
Am. Loco., com...	63 - 68 1/2	U. S. Steel, com.	84 1/4 - 87 1/4
Am. Loco., pref.	99 3/4 - 100	U. S. Steel, pref.	117 1/4 - 117 3/4
Am. Steel Fdries.	46 - 50 1/2	Va. I. C. & Coke...	48
Bald. Loco., com.	68 1/4 - 73 1/2	Westing. Elec...	55 1/4 - 59 3/4
Bald. Loco., pref.	105 1/2	Am. Rad., com...	395 - 400
Beth. Steel, com.	440 - 449 1/2	Am. Rad., pref...	134 1/2
Colorado Fuel...	42 - 44 1/2	Am. Ship, com...	41 3/4 - 43
Deere & Co., pref.	90	Am. Ship, pref...	88 3/4 - 90
Gen. Electric...	166 - 169 3/4	Cambria Steel...	82 - 82 1/2
Gt. No. Ore Cert.	34 3/4 - 36 3/4	Lake Sup. Corp.	10 3/4 - 11 3/4
Int. Harv. of N. J.,		Warwick	9 1/2
com.	112 1/2 - 118	Cruc. Steel, com.	68 3/4 - 74 1/2
Int. Harv. Corp.,		Cruc. Steel, pref.	114 - 114 3/4
com.	80 - 82	Harb.-Walk. Refrac.,	
Lackawanna Stl.	68 - 70 3/4	com.	95
Nat. En. & Stm.,		Harb.-Walk. Refrac.,	
com.	23 1/2 - 24 1/4	pref.	102 1/2 - 103
Nat. En. & Stm.,		La Belle Iron,	
pref.	94 3/4	com.	51 1/2
N. Y. Air Brake.	125 1/2 - 132 3/4	La Belle Iron,	
Pitts. Steel, pref.	97 - 97 1/2	pref.	128 1/2
Pressed Stl., com.	44 1/2 - 48 1/4	Can. Car & Fdy.,	
Pressed Stl., pref.	99 1/2	com.	80 - 82
Ry. Stl. Spring,		Driggs-Seabury	95 - 127
com.	42 1/2 - 45 1/4	Midvale Steel...	60 1/4 - 64 3/4

Dividends

The Union Steel Casting Company, regular quarterly 2 per cent and an extra 2 per cent, payable July 6.
The Canada Foundries & Forging Company, regular quarterly 3 per cent, with an extra 3 per cent on the common stock and 1 1/4 per cent on the preferred stock, payable Aug. 15.
The American Shipbuilding Company, regular quarterly, 1 3/4 per cent on the preferred stock, payable July 15.
The Harbison-Walker Refractories Company, regular quarterly, 1 1/2 per cent on the preferred stock, payable July 20.
The Atlantic Steel Company, regular quarterly, 1 1/2 per cent, payable July 10.
The Curtiss Aeroplane & Motor Company, 3 1/2 per cent on the preferred stock, payable July 15.

MESABA STRIKE SITUATION

Strikers Returning and Several Underground Mines Now in Operation

DULUTH, MINN., July 12—(By Telegraph).—The reconstruction period is now at hand on the Mesaba Range. Many of the strikers have returned to work and several of the underground miners have resumed operations. The pit properties are working to capacity but the underground mines have small forces. Men are returning to their former places every day, but the crews will not be as large as formerly, as hundreds of workers have left the district since the trouble started. Some of them will return but many are now working in other mining districts and will not go back. A few of the small independent operators will not reopen their mines until all of the trouble is over.

There was no violence of any sort in the past week. The sheriff has several hundred deputies and has the situation well in hand. There is practically no picketing now. Those who are endeavoring to keep men from their work are not very enthusiastic and are not getting results.

The miners seem to be discouraged. A meeting was called this week to try and settle the differences of the operators and men but the operators did not send a single representative. The villages and unions were represented. The operators have stated frequently that they absolutely refuse to have any dealings with any representative of the I. W. W. They will never accord that organization the smallest amount of recognition. There has been some talk that the I. W. W. would invade other parts of the Lake Superior district but this is not likely to happen with the failure of the Mesaba strike. Six of the strike leaders and four others are still in jail in Duluth, charged with the murders at Biwabik last week. No other outsiders have arrived to take their places.

A Ryerson Warehouse at Detroit

Evidence of Detroit's increasing importance as a center of steel consumption is given in the announcement that Joseph T. Ryerson & Son have prepared the way for a Detroit warehouse by the purchase of a suitable site. The property consists of about three acres in the Milwaukee Junction district, and is one of the few remaining vacant sites having the facilities of both Grand Trunk and Michigan Central Railroad direct trackage. It is the expectation that a modern warehousing unit, similar to this company's Chicago, New York and St. Louis plants, will be erected in the near future.

German Steel Shipments Large in May

Shipments of the German Steel Works Union for May were 311,620 metric tons, the largest this year, those for March having been 310,646 tons, and for April 271,756 tons. The May shipments embraced 80,765 tons of semi-finished steel, 142,327 tons of railroad material, and 88,528 tons of shapes. The total for 5 months to June 1, 1916, was 1,462,075 tons, against 1,466,162 tons to June 1, 1915.

A New Carnegie Steel Bar Card

The Carnegie Steel Company of Pittsburgh has recently issued a new card of standard classification of extras on steel bars and small shapes. Extras on tees, half rounds, half ovals and ovals have been slightly advanced in some cases and also for cutting to specified lengths.

Iron amalgam, in the shape of lamp or chandelier articles, as a substitute for copper, brass and bronze goods, was demonstrated at a recent fair at Leipzig, Germany. Certain toys were shown made from papier-mâché and from a number of new alloys which appeared as excellent as those formerly made of various metals.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast (by rail only), 65c.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, $\frac{1}{4}$ in. thick and over, and zees 3 in. and over, 2.50c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than $\frac{1}{4}$ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, $\frac{1}{4}$ in. thick, 6 in. up to 100 in. wide, 2.90c. to 4c., base, net cash, 30 days, or $\frac{1}{2}$ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras	Cents per lb.
Tank steel	.Base
Pressing steel (not flange steel for boilers).	.10
Boiler and flange steel plates.	.15
"A. B. M. A." and ordinary firebox steel plates.	.20
Still bottom steel	.30
Locomotive firebox steel	.50
Marine steel, special extras and prices on application	

Gage Extras	Cents per lb.
Rectangular, $\frac{1}{4}$ in. thick, over 6 in. wide to 100 in. wide..Base	
Lighter than $\frac{1}{4}$ in., to 3/16 in., up to 72 in. wide.	.10
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 72 in. to 84.	.20
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 84 in. to 96.	.30
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 96 in. to 100.	.40
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 100 in. to 102.	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide.	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84.	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96.	.35
Lighter than No. 8, including No. 10, up to 60 in. wide.	.30
Lighter than No. 8, including No. 10, over 60 in. to 64.	.35
Up to 72 in., not less than 10.2 lb. per sq. ft. will be considered $\frac{1}{4}$ in.	
Over 72 in. must be ordered $\frac{1}{4}$ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.	
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.	
Over 72 in., ordered weight 3/16 in., take No. 8 price.	
Over 72 in., ordered weight No. 8, take No. 10 price.	

Width Extras	Cents per lb.
Over 100 in. to 110 in. inclusive.	.05
Over 110 in. to 115 in. inclusive.	.10
Over 115 in. to 120 in. inclusive.	.15
Over 120 in. to 125 in. inclusive.	.25
Over 125 in. to 130 in. inclusive.	.50
Over 130 in.	1.00

Length Extras	Cents per lb.
Universal plates 80 ft. long up to 90 ft. long.	.05
Universal plates 90 ft. long up to 100 ft. long.	.10
Universal plates 100 ft. long up to 110 ft. long.	.20

Cutting Extras	Cents per lb.
No charge for rectangular plates to lengths 3 ft. and over.	
Lengths under 3 ft. to 2 ft. inclusive.	.25
Lengths under 2 ft. to 1 ft. inclusive.	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in. (width extra).	.30
Circles over 100 to 110 in. (width extra).	.35
Circles over 110 to 115 in. (width extra).	.40
Circles over 115 to 120 in. (width extra).	.45
Circles over 120 to 125 in. (width extra).	.55
Circles over 125 to 130 in. (width extra).	.80
Circles over 130 in. (width extra).	1.30
Circles under 3 ft. to 2 ft. inclusive.	.55
Circles under 2 ft. to 1 ft. inclusive.	.80
Circles under 1 ft.	1.85
Half circles take circle extras.	
Sketches, not over four straight cuts, inc. straight taper.	.10
Sketches having more than four straight cuts.	.20
Plates sheared to a radius take complete circle extras.	

*Including extra for width.

Wire Rods.—Including chain rods, \$55 to \$60.

Wire Products.—Prices to jobbers, effective May 1: Fence wire, Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.45; galvanized, \$3.15. Galvanized barb wire and staples, \$3.35; painted, \$2.65. Wire nails, \$2.50 to \$2.60. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Cement-coated nails, \$2.50. Woven wire fencing, 61½ per cent off list for carloads, 60½ off for 1000-rod lots, 59½ off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Nos.	6 to 9	10	11	12	13	14	15	16
Annealed	\$2.50	\$2.55	\$2.60	\$2.65	\$2.75	\$2.85	\$2.95	\$3.05
Galvanized	3.20	3.25	3.30	3.35	3.45	3.55	4.00	4.10

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from April 21, 1916, all full weight pipe:

Plain Wire, per 100 lb.			
Nos.	6 to 9	10	11 12 13 14 15 16
Annealed	\$2.50	\$2.55	\$2.60 \$2.65 \$2.75 \$2.85 \$2.95 \$3.05
Galvanized	3.20	3.25	3.30 3.35 3.45 3.55 4.00 4.10

Butt Weld			
Inches	Steel	Black	Galv.
$\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$	63	30½	31½
$\frac{3}{8}$	67	46½	47½
$\frac{1}{2}$ to 3	70	50½	51½

Lap Weld			
Inches	Steel	Black	Galv.
$\frac{1}{4}$ and $\frac{3}{8}$	65	45½	46½
$\frac{3}{8}$ to 6	68	48½	49½
7 to 12	65	44½	45½
13 and 14	53½	..	..
15	51	..	..

Reamed and Drifted			
Inches	Steel	Black	Galv.
$\frac{1}{4}$ to 1½, butt.	55	32	33
$\frac{1}{4}$ to 1½, lap	43	20	21
$\frac{1}{2}$ to 4, lap	49	27	28
$\frac{3}{4}$ to 6, lap	50	28	29
$\frac{1}{2}$ to 4, lap	52	31	32

Butt Weld, extra strong, plain ends			
Inches	Steel	Black	Galv.
$\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$	59	35½	36½
$\frac{3}{8}$	64	45½	46½
$\frac{1}{2}$ to 1½	68	49½	50½
2 to 3	69	50½	51½

Lap Weld, extra strong, plain ends			
Inches	Steel	Black	Galv.
$\frac{1}{4}$ to 1½	63	44½	45½
$\frac{3}{8}$ to 4	66	47½	48½
$\frac{1}{2}$ to 6	65	46½	47½
$\frac{3}{4}$ to 8	61	40½	41½
9 to 12	56	35½	36½

Butt Weld, double extra strong, plain ends			
Inches	Steel	Black	Galv.
$\frac{1}{4}$	55	38½	39½
$\frac{3}{8}$ to 1½	58	41½	42½
2 to 2½	60	43½	44½

Lap Weld, double extra strong, plain ends			
Inches	Steel	Black	Galv.
$\frac{1}{4}$	55	38½	39½
$\frac{3}{8}$ to 4	57	40½	41½
$\frac{1}{2}$ to 6	56	39½	40½
$\frac{3}{4}$ to 8	51	30½	31½

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Sheets.—Makers' prices for mill shipments on sheets, of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets	
Nos.	Cents per lb.
Nos. 3 to 8	2.95 to 3.20
Nos. 9 to 10	3.00 to 3.25
Nos. 11 and 12	3.05 to 3.30
Nos. 13 and 14	3.10 to 3.35
Nos. 15 and 16	3.20 to 3.45

Box Annealed Sheets, Cold Rolled	
Nos.	Cents per lb.
Nos. 17 to 21	2.70 to 2.80
Nos. 22 and 24	2.75 to 2.85
Nos. 25 and 26	2.80 to 2.90
No. 27	2.85 to 2.95
No. 28	2.90 to 3.00
No. 29	2.95 to 3.05
No. 30	3.15 to 3.25

Galvanized Sheets of Black Sheet Gage	
Nos.	Cents per lb.
Nos. 10 and 11	3.50 to 3.60
No. 12	3.60 to 3.70
Nos. 13 and 14	3.60 to 3.70
Nos. 15 and 16	3.70 to 3.80
Nos. 17 to 21	3.85 to 3.95
Nos. 22 and 24	3.95 to 4.05
Nos. 25 and 26	4.10 to 4.20
No. 27	4.35 to 4.45
No. 28	4.50 to 4.60
No. 29	4.65 to 4.75

Boiler Tubes.—Discounts on less than carloads, freight to destination added, effective from April 15, 1916, are as follows:

Lap Welded Steel	
Inches	Cents per lb.
$\frac{1}{4}$ in.	.35
$\frac{3}{8}$ and 2 in.	.47
$\frac{1}{2}$ in.	.44
$\frac{3}{4}$ and 2½ in.	.50
2½ and 3½ in.	.55
3½ to 4½ in.	.56
5 and 6 in.	.49
7 to 13 in.	.46

Standard Charcoal Iron	
Inches	Cents per lb.
$\frac{1}{4}$ in.	.27
$\frac{3}{8}$ and 2 in.	.39
$\frac{1}{2}$ in.	.36
$\frac{3}{4}$ and 2½ in.	.42
2½ and 3½ in.	.47
3½ to 4½ in.	.48
5 and 6 in.	.41
7 to 13 in.	.38

Locomotive and steamship special charcoal grades bring higher prices.

$\frac{1}{4}$ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Tin, Electro-lytic	New York	Lead, New York		Spelter, New York	
July	Lake			New	St. Louis	New	St. Louis
5.....	26.75	26.50	39.00	6.50	6.40	10.50	10.25
6.....	26.50	26.25	39.00	6.45	6.30	10.00	9.75
7.....	26.50	26.25	39.00	6.45	6.30	9.50	9.25
8.....	26.50	26.25	.....	6.45	6.30	9.50	9.25
10.....	26.25	26.00	38.75	6.45	6.25	9.25	9.00
11.....	26.00	25.75	38.50	6.45	6.25	9.00	8.75

NEW YORK, July 12, 1916.

The reaction in the metals continues. Copper is dull, with second-hand offerings making the market. Tin is quiet and lower. Lead has shown a little activity, but prices are lower. Consumers continue to neglect spelter, except for inquiry, and it has declined steadily. Antimony is nominally lower.

New York

Copper.—The market has continued extremely dull in the past week, and the nominal quotations are based entirely on offerings by second hands. While prompt electrolytic may nominally be called 25.75c., cash, New York, it is probable that 25.50c. would be accepted, although some sellers quote up to 26c. Lake is around 26c., cash. At these prices, however, not a great deal of metal can be obtained. Most of the larger producers, all of whom are well sold up, are quoting 28c. to 29c. for publication, but it is known that they are willing to make substantial concessions for future deliveries; and it is furthermore intimated that some of the metal now being offered by brokers really belongs to producers. If the market is to be sustained, war orders must be forthcoming. The one supporting influence at present is the fact that the producers are so comfortably booked. The London quotation for electrolytic is down to £128. The exports this month, including yesterday, total 4913 tons.

Tin.—In the week ended July 8, probably not more than 250 tons was dealt in, and this week the market has been dull to the point of stagnation. The explanation lies in the heavy June deliveries. Yesterday, the price of spot Straits was 38.50c., with spot Banca at 37.75c. The London market and that of Singapore is weak, with Straits at London down to £169 15s. The arrivals this month total 725 tons, and there is afloat 2234 tons.

Lead.—This metal has been the most active on the list, but this is not saying much. While some interests did very little last week, others say their sales amounted to a fair aggregate. Late on July 5 the American Smelting & Refining Company reduced its price $\frac{1}{2}$ c. to 6.50c., New York, and 6.42 $\frac{1}{2}$ c., St. Louis, a drop of \$10 per ton. It is assumed that the leading interest was not getting its share of what little business was stirring and therefore lowered its quotations. The move did little good, however, as the independents immediately cut the new price from \$1 to \$2 per ton. Following the reduction there was a fair amount of buying by consumers who had allowed their stocks to become low, but it only lasted one day and since then quiet has prevailed. Independents yesterday quoted 6.45c., New York, and 6.25c., St. Louis. The exports this month total 1037 tons, including those of yesterday.

Spelter.—The downward course of the market has continued without a break and a point has been reached where the producers are not anxious to sell, especially for future delivery. Yesterday there was a good volume of inquiry from galvanizers, indicating that the level of prices is beginning to arouse interest on their part. As yet, however, little or no business has resulted. Prompt spelter was to be had yesterday at 9c., New York, and 8.75c., St. Louis. August delivery is around 8.25c., St. Louis, and September at about 8c. In London the market has been declining, and yesterday spot metal stood at £44. The dull and easy market is ascribed to big stocks and over production. Reports from the

West say that mines are closing down and the production of ore already shows a substantial decrease. Interest is taken in offerings of Japanese spelter in this market, but the quantities are too small to have any great effect on conditions. The exports this month, including yesterday, total 2124 tons. Sheet zinc is now quoted at 15c., carload lots f.o.b. smelter, 8 per cent off for cash.

Antimony.—Prompt metal is offered at 15.50c. and that in bond at 12c., but there is no business.

Aluminum.—No. 1 virgin aluminum, 98 to 99 per cent pure, spot delivery, is quoted at 58c. to 60c. per lb.

Old Metals.—The market is very unsettled and still declining. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.....	23.00 to 24.00
Copper, heavy and wire.....	22.00 to 23.00
Copper, light and bottoms.....	17.50 to 18.50
Brass, heavy.....	13.00 to 14.00
Brass, light.....	10.50 to 11.00
Heavy machine compositions.....	17.00 to 18.00
No. 1 yellow rod brass turnings.....	13.50 to 14.50
No. 1 red brass or composition turnings.....	14.50 to 15.50
Lead, heavy.....	6.00
Lead, tea.....	5.50
Zinc.....	7.00 to 8.00

Chicago

JULY 10.—With trading light in all of the metals, concessions and a lower level of prices are the rule. Another substantial reduction in spelter prices is noted. We quote: Casting copper, 24.25c.; Lake copper, 26.75c.; tin, carloads, 39.25c., and small lots, 42c.; lead, 6.45c.; spelter, 9c.; sheet zinc, 17c.; Cookson's antimony, 50c.; other grades, 18.50c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 18c.; copper bottoms, 16c.; copper clips, 17c.; red brass, 16c.; yellow brass, 12c.; lead pipe, 4.75c.; zinc, 5.50c.; pewter, No. 1, 27c.; tinfoil, 27.50c.; block tin pipe, 32.50c.

St. Louis

JULY 10.—Weakness predominates with quotations at the close to-day as follows: Lead, 6.25c.; spelter, 9.50c. to 10c.; tin, 39c.; Lake copper, 27c.; electrolytic copper, 26.50c.; antimony, Asiatic, 22c. In the Joplin district prices declined further as a result of conditions in the spelter market so that the range of prices for zinc blende, basis of 60 per cent zinc, was from \$80 for first grade ores down to \$60, with the average for the week \$70. Calamine sold at \$40 to \$55, with the average for the week \$44. Lead ore decreased \$2.50 per ton to \$75, basis of 80 per cent metal, with the district average at \$73. The district production continues very heavy and the market is not strong enough to consume all the ore made. It is estimated that about 25,000 tons of ore are now stored in the district with every prospect of an increase. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 8.50c.; heavy yellow brass, 11.50c.; heavy red brass and light copper, 15c.; heavy copper and copper wire, 18c.; pewter, 25c.; tinfoil, 32c.; zinc, 7.50c.; lead, 5c.; tea lead, 4c.

Creditors and bondholders of the Dayton Coal & Iron Company, at a meeting in Chattanooga, Tenn., agreed to a private sale of the property of the bankrupt company. Besides two blast furnaces at Dayton, Tenn., one 80 ft. x 18 ft. 3 in., and the other 75 x 17 ft., partly dismantled, the property includes 357 beehive coke ovens. S. M. Chambliss represented the Central Trust Company, New York, and other bondholders.

The Stowell Mfg. & Foundry Company, South Milwaukee, Wis., operating malleable, gray iron and brass foundries and a machine shop specializing in the production of stamped products and the manufacturing of complete articles for the market, has changed its name to the Stowell Company.

The offices of the C. Newman Wire Company, Inc., maker of tempered and untempered cast steel wire and round, flat and special shapes of cold-rolled steel, have been removed from 143 Liberty Street, New York, to 25 Church Street.

BETHLEHEM CHANGES

Acquisition of Pennsylvania Steel Company Properties Formally Completed

The following announcement was made on July 6, signed by the Bethlehem Steel Company, E. G. Grace, president, and the Pennsylvania Steel Company, E. C. Telton, president:

"All of the properties and businesses as going concerns of the Pennsylvania Steel Company and Maryland Steel Company have this day been acquired by Penn-Mary Steel Company, a subsidiary of Bethlehem Steel Company, and such properties and businesses will hereafter be operated under lease by Bethlehem Steel Company, which has taken over all contracts, has acquired all current accounts and is prepared to meet all outstanding obligations of such companies when due.

"All unfinished contracts of these companies will be carried out and performed by Bethlehem Steel Company without interruption.

"The books of account will be kept at, and all payments will be made from, South Bethlehem, Pa., and checks for accounts due to the Pennsylvania Steel Company or Maryland Steel Company should be drawn to the order of Bethlehem Steel Company and mailed to South Bethlehem, Pa.

"The executive, treasury, accounting, sales and purchasing departments will have their headquarters at South Bethlehem, Pa., to which letters intended for their attention should be addressed."

As was indicated some time ago, the procedure in connection with the Bethlehem acquisition of the Pennsylvania and Maryland properties means the complete disappearance of these companies, their places being taken by the new corporation, known as the Penn-Mary Steel Company. Among the legal procedures marking the change was the filing at Harrisburg on July 6 of a deed transferring the Pennsylvania Steel Company's holdings to the Penn-Mary Steel Company, South Bethlehem, Pa. The consideration was \$10,167,297. At the same time a mortgage for \$60,000,000 was recorded against the property, with the Bankers' Trust Company, trustee, of New York, as holder. The Penn-Mary Steel Company was incorporated at Harrisburg about two weeks ago.

New Operating Appointments

Many changes in the operating and selling organizations result from the merger, and formal announcement of most of these was made on July 6.

L. W. Adams was appointed superintendent of Saucon plant, South Bethlehem; vice R. F. Randolph, general superintendent, resigned. R. M. Bird becomes superintendent of the rolling mills of the Lehigh plant, succeeding L. W. Adams, and William Bangser succeeds R. M. Bird as superintendent of the treatment department, Lehigh plant.

W. J. Thomas, who has been superintendent of the roll shops, has now been made superintendent of mills, Saucon plant. W. H. Clark of Bethlehem has resigned as superintendent of the Grey mill at the Saucon plant, and has accepted a position at Duluth, Minn.

Frank D. Carney, superintendent of the Steelton plant, becomes general metallurgist for the Bethlehem Steel Company and will be stationed at Bethlehem.

William S. Rutherford of the order department at Steelton becomes head of the order department at Bethlehem and will have charge of the distribution of all orders to the various plants.

Frank A. Robbins, Jr., confidential advisor to the former vice-president and general manager, J. V. W. Reyniers, is retained in a similar capacity by General Manager Quincy Bent at Steelton.

Thomas O. Earle, superintendent of the bridge and construction department at Steelton; Charles H. Mercer, chief engineer, and Lewis E. Johnson, assistant to Mr. Earle, are transferred to South Bethlehem, where they will become part of the sales and engineering staff in charge of designing and field erection of work in connection with the bridge shop.

Carl B. Ely, assistant to the superintendent of the bridge and construction department of the Steelton, Pa.,

plant, has been appointed superintendent in charge of operations by General Manager Quincy Bent, to succeed Thomas Earle.

Thomas A. Laux, assistant to the chief engineer at the Steelton plant, has become assistant to the chief engineer at South Bethlehem, assuming his new duties July 10.

Charles A. Ford, who recently resigned as superintendent of transportation for the Pennsylvania Steel Company, at Steelton, Pa., has been appointed supervisor of yards on the Erie Railroad system, between Jersey City and Chicago, with headquarters at Jersey City.

John L. Howard has been made assistant general yardmaster of the Steelton, Pa., plant.

Changes in the Sales Organization

The general sales offices of the Pennsylvania Steel Company, the Maryland Steel Company and the Titusville Forge Company have been consolidated with the general sales office of the Bethlehem Steel Company. R. W. Gillispie, general manager of sales for the Pennsylvania and Maryland Steel companies at Philadelphia and Paul Mackall, sales agent for the Bethlehem Steel Company in the district of Pittsburgh and west, both go to Bethlehem as assistant general sales agents. Edward S. Knisely is general sales agent.

The following are sales agents of the combined branch offices and of the warehouses:

H. A. Jackson, Oliver Building, Boston.
J. M. Ellis, 111 Broadway, New York.
W. B. Kennedy, Morris Building, Philadelphia.
Jesse A. Davis, Continental Building, Baltimore.
H. W. Eisenhart, First National Bank Building, Pittsburgh.
J. N. Clarke, 1266 Ontario Street, Cleveland.
J. S. Hegeman, Majestic Building, Detroit.
R. E. Belknap, People's Gas Building, Chicago.
J. M. Price, Chemical Building, St. Louis.
E. S. Illig, Crocker Building, San Francisco.

J. M. Price has been Chicago district sales agent of the Bethlehem company and his successor, R. E. Belknap, was formerly in charge of the Chicago office of the Pennsylvania Steel Company and more recently in charge of that company's New York office. S. H. Smith, who has been in charge of the Chicago office of the Pennsylvania Steel Company, will handle the Chicago district sales in the frog and switch department of the Bethlehem Steel Company. Neil S. Salsich of the Philadelphia office becomes sales agent in charge of the frog and switch department at Bethlehem. The New York office will occupy all of the fourteenth floor of 111 Broadway, the present quarters on the eleventh floor not being large enough to accommodate the enlarged staff through the consolidation of New York sales offices.

Robert W. Reed, district sales manager for the central and western Pennsylvania districts, with office at Steelton, has resigned and will go into business at Philadelphia.

Large Outlays for Improvements

Following an inspection of the works at Steelton, Pa., Tuesday, July 11, Charles M. Schwab, chairman of the Bethlehem Steel Corporation, announced contemplated expenditures of \$15,000,000 on improvements at the Steelton plant. He added that the improvements in the blast furnace and power departments will be pushed to early completion. The new work contemplated is said to be additional coking plants, new rolling mills, including a plate mill, and general electrification.

For the works at Sparrows Point, Md., it is understood that plans have been made in a general way involving the expenditure of about \$20,000,000. In the inspection party accompanying Mr. Schwab were E. G. Grace, president; H. S. Snyder, C. A. Buck and F. W. Roberts, vice-presidents; F. A. Schick, comptroller, and Quincy Bent, general manager at Steelton. The inspection of the Sparrows Point plant took place Wednesday.

A South Bethlehem, Pa., telegram of July 10 refers to the announcement there on July 10 of a \$1,000,000 outlay at the Saucon plant, covering three 20-ton converters, a 1500-ton mixer and two 200-ton tilting open-hearth furnaces.

PERSONAL

George E. Emmons, who has been plant manager of the General Electric Company at Schenectady, N. Y., for twenty years, was recently elected a vice-president of the company.

The Sun Shipbuilding Company, Chester, Pa., announces the following elections and appointments: J. Howard Pew, Joseph N. Pew, Jr.; William C. Sproul, Robert Haig and J. A. Sim, members of the executive committee; Robert Haig, formerly chief engineer for Lloyd's, general manager of the shipbuilding company and president of Robert Wetherill & Co., Inc., owned by the shipbuilding concern; Henry J. Klaer, assistant to Mr. Haig and stationed at the Wetherill plant; James H. Garthwaite, general manager of the Wetherill plant; J. A. Sim, formerly of the Fore River Shipbuilding Company, Quincy, Mass., general manager of hull construction and shipyard departments; A. A. Howitz, chief engineer; W. Cunliff, assistant chief engineer; A. B. Saunders, chief naval architect. The last three have been connected with the New York Shipbuilding Company, Camden, N. J.

Oscar Hedstrom, from 1901 to 1912 chief designer of the Hendee Mfg. Company, Springfield, Mass., has again become connected with the company as mechanical engineer.

A. J. Lindemann, president of the A. J. Lindemann & Hoverson Company, Milwaukee, has been elected vice-president of the newly organized Wisconsin branch of the World Peace Court League.

John Bennett Bissell, formerly president of John Bennett Bissell, Inc., exporter, has been appointed manager of the export and Eastern structural sales departments of the Blaw Steel Construction Company, Pittsburgh. He will be located at the company's office, 165 Broadway, New York.

F. D. Halstead, who has been secretary and treasurer of the Mount Union Refractories Company, Mount Union, Pa., since its incorporation in 1911, has retired. For 11 years prior to that time he was secretary and treasurer and general manager of the Queen's Run Fire Brick Company.

J. A. Eden, Jr., resigned his connection with the Bausch Machine Tool Company, Springfield, Mass., on June 24. He has no plans for the future.

Dean Emerson, in charge of the Detroit office of the Wagner Electric Mfg. Company, St. Louis, has moved the office to 1291 Woodward Avenue.

C. B. Woticky has been appointed electrical engineer and D. J. Cartwright assistant electrical engineer of the Lehigh Valley Railroad to standardize the electrical equipment and operation in shops and elsewhere. Both officials will have their offices in South Bethlehem, Pa.

James Brennan, who has been chief engineer and also in direct charge of the extensive improvements of the Crucible Steel Company of America, Pittsburgh, at its various plants for over six years, has resigned to go West. He expects to engage in engineering practice with headquarters in Chicago. J. H. Burgwin has been appointed to succeed him.

James B. Luttrell has been appointed district engineer of the Crucible Steel Company of America, with headquarters at Pittsburgh. This is a newly created position.

Albert J. Soden has been appointed mechanical engineer for the Pittsburgh district of the Crucible Steel Company of America.

Williard Wilson has been appointed manager of sales in the Birmingham, Ala., district for the Carnegie Steel Company, the Tennessee Coal, Iron & Railroad Company and the Illinois Steel Company, succeeding F. A. Burr, who resigned on July 1.

Lyon Smith has been appointed a metallurgist for the Snyder Electric Furnace Company, Chicago, Ill.

A. F. Huston, president Lukens Iron & Steel Company, and H. I. Schotter, general manager Worth Brothers Company, have been elected president and vice-president respectively of the Chamber of Commerce of Coatesville, Pa., recently organized.

Robert J. Anderson has accepted a position as metallurgist with the American Rolling Mill Company, Middletown, Ohio.

Tracy W. Guthrie, formerly president of the Republic Iron & Steel Company, has been elected president and director of the reorganized United Coal Company.

Dr. William O'Neil Sherman, Pittsburgh, will represent the United States Steel Corporation and subsidiaries in research work outlined by the Rockefeller Institute at the base of the European field hospitals.

Unfilled Steel Orders Decrease

The monthly statement of the United States Steel Corporation for June showed a decrease in unfilled orders on its books of 297,340 tons, which is the first decrease since August, 1915. The total of unfilled orders at the close of business, June 30, was 9,640,458 tons. The following table shows the unfilled tonnage for each month, beginning Dec. 31, 1912:

June 30, 1916.....	9,640,458	Aug. 31, 1914.....	4,213,331
May 31, 1916.....	9,937,798	July 31, 1914.....	4,158,589
April 30, 1916.....	9,829,551	June 30, 1914.....	4,032,857
Mar. 31, 1916.....	9,331,001	May 31, 1914.....	3,998,160
Feb. 29, 1916.....	8,568,966	April 30, 1914.....	4,277,068
Jan. 31, 1916.....	7,922,767	Mar. 31, 1914.....	4,653,825
Dec. 31, 1915.....	7,806,220	Feb. 28, 1914.....	5,026,440
Nov. 30, 1915.....	7,189,489	Jan. 31, 1914.....	4,613,680
Oct. 31, 1915.....	6,165,452	Dec. 31, 1913.....	4,282,108
Sept. 30, 1915.....	5,317,618	Nov. 30, 1913.....	4,396,347
Aug. 31, 1915.....	4,908,455	Oct. 31, 1913.....	4,513,767
July 31, 1915.....	4,928,500	Sept. 30, 1913.....	5,003,785
June 30, 1915.....	4,678,196	Aug. 31, 1913.....	5,223,468
May 31, 1915.....	4,264,598	July 31, 1913.....	5,399,356
April 30, 1915.....	4,162,244	June 30, 1913.....	5,807,317
Mar. 31, 1915.....	4,255,749	May 31, 1913.....	6,324,322
Feb. 28, 1915.....	4,345,374	April 30, 1913.....	6,978,762
Jan. 31, 1915.....	4,248,571	Mar. 31, 1913.....	7,468,956
Dec. 31, 1914.....	3,836,643	Feb. 28, 1913.....	7,656,714
Nov. 30, 1914.....	3,324,592	Jan. 31, 1913.....	7,827,368
Oct. 31, 1914.....	3,461,097	Dec. 31, 1912.....	7,932,164
Sept. 30, 1914.....	3,787,667		

Plant Extensions of American Steel & Wire Co.

The 127-in. plate mill in the Shoenberger works of the American Steel & Wire Company at Pittsburgh, which has been operated only for short periods since 1907, is being made ready to start up. A good part of the equipment of this mill has been dismantled in the last few years and moved to other works of the company, and will have to be replaced. It is expected the mill will start about Sept. 1, and will have a monthly output of 4000 tons or more of sheared plates up to 120 in. wide.

Eight out of 10 furnaces in the zinc plant of the American Steel & Wire Company, at Donora, Pa., are in operation, and are turning out nearly their maximum output of zinc.

This company is also putting up a Koppers by-product coke plant at Cleveland, which will be ready for operation late in the year.

Italian Iron and Steel Imports in 1915

Italian imports of important steel products in 1915, as compared with those of 1913 and 1914, are given by the Board of Trade as follows, in metric tons:

	1913	1914	1915
Pig iron	221,688	219,994	240,365
Scrap	326,220	254,892	261,196
Steel ingots and blooms	7,287	17,416	64,032
Rails	7,154	5,251	1,871
Bars and rods	93,801	95,885	72,391

Total imports of iron and steel were 690,499 tons in 1915, against 669,412 tons in 1914, and 741,847 tons in 1913.

The Mississippi Valley Transportation Company has been formed at St. Louis by Thomas S. Maffitt, J. D. Dana, and Edward F. Goltra, all interested in the new Mississippi Valley Iron Company, whose blast furnace at St. Louis will blow in about Aug. 1, for the purpose of establishing a barge system which will transport ore from the Waukon, Iowa, fields and elsewhere for the new furnace.

Pittsburgh and Nearby Districts

The leaders of the riot at the Edgar Thomson works of the Carnegie Steel Company at Bessemer, and the McClintic-Marshall Company works at Rankin, Pa., on May 1 and 2, were given severe sentences by the court in Pittsburgh last week. Fred W. Merrick, who is regarded as the leader of the strike, was sentenced to three years and six months in the workhouse. John H. Hall, who was president of the American Industrial Union, and whose discharge from the employ of the Westinghouse Company led to the strike, turned State's evidence, and was given one year in jail. Rudolph Bloom, one of the leading figures in the strike, was sent to jail for 18 months; and Anna Goldberg, the only woman convicted of participating in the riot, was sent to jail for one year.

The American Reduction Company, which now operates a plant in Pittsburgh, detinning the pig tin on old cans, finds that the quantity of cans that is offered is much larger than it can handle, and will build a new plant on the Baltimore & Ohio Railroad, in the Pittsburgh district, capable of taking care of 50 to 75 tons of tin cans per day.

The Carnegie Steel Company of Pittsburgh is adding a third unit to its Schoen steel wheel works at McKees Rocks, Pittsburgh. The present plant contains two units, turning out 1000 to 1200 solid forged and rolled-steel carwheels, and when the third unit is finished the capacity will be 1500 to 1800 carwheels per day. The new unit will be electrically driven, and is expected to be finished about Jan. 1, 1917.

The Ohio Steel Foundry Company, Lima, Ohio, is increasing its capital stock from \$600,000 to \$800,000.

The Mahoning Valley Steel Company, Niles, Ohio, has been incorporated under the laws of Ohio, with a capital stock of \$600,000. The incorporators are Thomas E. Thomas, W. Aubrey Thomas, Jacob D. Waddell, John T. Harrington, and J. W. Blackburn. This is the company that is building a new six-mill sheet plant at Niles, Ohio, of which Jacob D. Waddell will likely be elected president. He was formerly manager of sales of the Brier Hill Steel Company, and W. A. Thomas is president of that concern.

The Schlieper Engineering Company, Ferguson Building, Pittsburgh, is acting as consulting engineer for the new plant of the Witherow Steel Company, to be built on Neville Island, Pittsburgh, referred to on page 1584 of THE IRON AGE of June 29. All operations in each department of the new plant, including mill drives and tools, will be electrical and automatic. Roller and conveying tables will be used, doing away with all hand work as much as possible. The equipment includes a 15-in. slitting stand, two complete trains of 14-in. mills, and one complete train of 9-in. mills, all driven individually by a 500-hp. motor each. Besides being well equipped with extra rolls for changing, there will be supplied two complete stands of 14-in. mill housings, always ready for making complete changes in rolling material.

A. Rasner, who has been president of the Standard Gauge Steel Company, Beaver Falls, Pa., since it was organized, has, with several of the directors, sold his stock in the company, largely to parties identified with the Union Drawn Steel Company, Beaver Falls. They will retire. On Tuesday, July 18, the directors will hold a meeting, at which a successor to Mr. Rasner will be elected, and also new directors to take the places vacated.

The Union Switch & Signal Company, Swissvale, Pittsburgh, will supply automatic block signals and other signal and safety devices for 35 miles of the Atlanta & West Point Railroad.

The Carnegie Steel Company, Pittsburgh, has completed a census of employees who recently enlisted for army service, the results being as follows: General office, 6; Homestead works, 25; Edgar Thomson works, 20; upper and lower Union mills, Pittsburgh, 3; Ohio works, Youngstown, 15; upper and lower Union mills, Youngstown, 2; New Castle plant, 15; Columbus works, 3; Waverly, N. J., warehouse, 3; Baltimore warehouse,

2; Philadelphia offices, 3; Duquesne works, Clark's mills, Neville furnace, and the New Orleans sales office, one each. All these men are to be paid full time while in service, and their positions will be held for them until they return to work.

A Pennsylvania charter has been granted to the Clairton By-Product Coke Company, which will be a subsidiary of the Carnegie Steel Company, and will handle its by-product coke operations at Clairton, Pa., and possibly at other points. As yet, no officials have been elected, nor has the capital stock been determined upon.

A special meeting of the stockholders of the Ohio Fuel Supply Company will be held in its offices in the Farmers Bank Building, Pittsburgh, on Tuesday, July 18, to authorize an increase in the capital stock from \$15,000,000 to \$20,000,000. It is said the increased capital will be used by the company for acquiring 51 per cent of stock of the United Fuel Gas Company now held by the Columbia Gas & Electric Company.

The Westinghouse Air Brake Company, Wilmerding, Pa., has completed an order for 1,250,000 18-lb. shells for the Allies, and has discontinued the manufacture of shells. The company has let out from its service about 2000 men and women. Reports that the munition-making plants of the company would be dismantled are incorrect. The equipment will be retained, against the possibility of need by the United States Government. The airbrake department has sufficient orders for time fuses to keep that department running until about Jan. 1, 1917.

Julian Kennedy, Bessemer Building, Pittsburgh, has been retained as consulting engineer for four blast furnaces and other manufacturing plant to be erected by Henry Ford, Ford Motor Company, Detroit. The present program includes four blast furnaces, two to be erected at once, and a steel works and a plant for making tractors.

The usual annual conference of salesmen of the Colonial Steel Company, whose works are at Colona, Pa., was held in Pittsburgh last week. A total of 33 salesmen from the various large cities were in attendance. Plans and policies for the coming business year were discussed, and the salesmen were guests of the company at a dinner at the Fort Pitt Hotel, Friday night, July 7.

The commissioners of water works, Erie, Pa., are receiving sealed proposals for a 20,000,000-gal. turbine-driven, centrifugal condensing pumping unit. Plans are being prepared by Chester & Fleming, hydraulic engineers, Pittsburgh.

The Ball Engine Company, Erie, Pa., has let a contract for a 65 x 182-ft. factory addition.

The Whitaker-Glessner Company, Wheeling, W. Va., is placing contracts for its 500-ton blast furnace at Portsmouth, Ohio. The furnace and stoves are to be built by the William B. Pollock Company, Youngstown, Ohio. The Ingersoll-Rand Company, New York, will furnish the turboblowers; the General Electric Company, the turbines and motor-generator sets, and the Sheridan-Kirk Contract Company, the foundations. The stack will not likely be completed before the late summer of 1917.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, is furnishing the electrical equipment and the Westinghouse Air Brake Company, Wilmerding, Pa., the airbrakes, for 240 all-steel cars to be delivered shortly to the Pittsburgh Railways Company.

The corner stone of the new Chamber of Commerce Building, to be located at Seventh Avenue and Smithfield Street, Pittsburgh, was laid on July 8. The first Pittsburgh Chamber of Commerce was organized just 40 years before the corner stone was laid for the new building. The new building is being erected by George T. Oliver, formerly prominently identified with the Oliver Iron & Steel Company and the Oliver Wire Company.

Follansbee Brothers Company, Pittsburgh, which operates a steel plant at Follansbee, W. Va., containing three open-hearth furnaces and seven sheet and six tin mills, has been considering the building of a new

sheet mill, probably in some other location. A number of sites have been looked over. In the event that a site should be chosen it is not likely anything will be done this year on account of the high prices ruling for structural steel and labor. The company will not, in any event, add to its tin-plate capacity.

In June, out of 118 suggestions given by employees of the Cambria Steel Company, Johnstown, Pa., for betterment in service or in methods of manufacture, ten were adopted and awarded prizes. The boxes are placed at the exits of the different plants, and the workmen write out their suggestions and sign their names.

Owing to various delays in deliveries of materials and for other causes, the Youngstown Sheet & Tube Company does not expect to make coke in its new by-product coke plant at East Youngstown, Ohio, before September. It was expected to have the plant of 204 ovens completed in July.

A. M. Byers Company, Inc., of Pittsburgh, which operates a large puddling plant at Girard, Ohio, announces that its puddlers will be paid \$8.40 per gross ton during July and August. This is an advance of about \$1 over the rate paid in May and June, and is the highest rate paid for puddling since November, 1866, when it is said \$9 per ton was paid for about one month under a sliding scale in force then.

New Heroult Electric Furnaces

Licenses for the installation of nine more Heroult electric furnaces have been issued by the United States Steel Corporation as follows:

The Lunkenheimer Company, Cincinnati, Ohio, will install a 1-ton furnace for making steel castings.

The Warman Steel Casting Company, Los Angeles, Cal., is operating a 1-ton furnace for making steel castings from cold scrap.

The Damascus Crucible Steel Casting Company, New Brighton, Pa., will install a 2-ton furnace for making manganese steel castings, using cold scrap.

The Timken Roller Bearing Company, Canton, Ohio, has ordered two more 6-ton furnaces for making steel for seamless tubes. These are in addition to the two 6-ton furnaces already provided for.

The Armstrong-Whitworth Company of Canada at Longueuil, Que., will install two 6-ton furnaces for making forged tires, wheels and axles from cold scrap. These are in addition to the one 3-ton furnace used for making tool steel.

Henry Disston & Sons, Inc., Tacony, Philadelphia, is to install one 3-ton furnace for making saw and tool steel from cold scrap.

The Tennessee Coal, Iron & Railroad Company, Ensley, Ala., is to install a 6-ton furnace for melting ferromanganese.

The building of the above will bring the number of Heroult furnaces in operation or contracted for in the United States and Canada to 72. Inquiry for new installations is reported to continue spirited. It is interesting to note that two American companies producing electric steel ingots from Heroult furnaces have recently sold 1000 tons each of steel billets for export to Italy.

A Blast Furnace for British Columbia

A movement is on foot to establish a blast-furnace plant in British Columbia. At a recent meeting of representatives of the Vancouver Chamber of Mines and the Intermunicipal Industries Committee, and others, a resolution was passed for the employment of a staff of engineers to report in four months on the supplies of iron ores accessible to the coast, and on the feasibility of establishing a smelter for such ores on the coast. At present there is only one small Bessemer-steel casting plant in British Columbia, but there are a number of copper smelters.

G. Hartmann, Ltd., machinery dealer, Christiania, Norway, has opened an office at room 729, Tribune Building, New York City. Catalogs and price lists of machinery, iron and steel products and copper and brass specialties are desired.

STRIKES AND SETTLEMENTS

Eight-Hour Demand at Milwaukee

MILWAUKEE, Wis., July 11—(By Telegraph).—The feeling is general in the metal trades that the local controversy over hours of labor will not result in a strike. Mass meetings of machinists, pattern-makers and molders were held Friday night, July 7, and union officials were authorized to present the demand for an eight-hour day at the present nine-hour wage and to declare a strike if the demand was not granted.

Only a small percentage of the local machine shops and foundries had received any communication from the machinists and patternmakers up to Tuesday night. The letter sent to some companies does not mention the eight-hour day, but says "the time has come when we must with firmness and resolution insist upon a substantial reduction of the hours worked per day without a reduction of the daily pay." The employers have issued a statement saying that while no formal demand for an eight-hour day has been put before them, their information being informal and unofficial, they will not change present conditions, as they are convinced they are dealing fairly with their employees. As proof of this they cite the fact that on July 1 they voluntarily reduced the weekly working schedule from 55 hours to 52½ hours.

Conditions in Ohio

The William Tod Company, Youngstown, Ohio, whose machinists have been on a strike since May 1, and whose machine shops have been practically closed since that date, has reopened them with new men secured from other places. These men were brought to Youngstown under the direction of the Mahoning Valley Employers' Association and the National Metal Trades Association. The new machinists will be housed and fed by the company. The Youngstown Foundry & Machine Company, Youngstown, Ohio, has likewise reopened its shop. A number of its former employees have returned to work and others are expected soon to follow.

Labor conditions in Cincinnati are about normal, with only a very few shops working less than the usual force. Some plants are employing more men now than at this time last year. Reports from nearly all sources indicate that employers have been surprisingly successful in training green help to take the places of striking workmen, and the output in a few shops is considerably above normal.

At Hamilton, Ohio, one large shop is still having trouble, but new men are being employed to take the places of the strikers, and this company expects to be operating normally at an early date. At Dayton, Springfield and Columbus, Ohio, no changes are reported, with only a few shops affected at any of these points.

Other Localities

The five-months' strike of the boilermakers, iron shipbuilder journeymen and apprentices of the Seattle Construction & Dry Dock Company, Seattle, has been settled, and the men have returned to work. The strike involved nearly 400 mechanics, and practically all of the men will be reinstated.

The John E. Thropp's Sons Company, maker of machinery and appliances for the manufacture of automobile tires, Trenton, N. J., is now operating under open shop conditions. The molders have been on strike for the past five months.

Bonus Wage Payments

The National Machinery Company, Tiffin, Ohio, has adopted a bonus plan under the terms of which the employees will be given 20 per cent bonus of their wages for the six months starting July 1. Payments will be made on the first pay-day in January.

The employees of the Carpenter Steel Works, Reading, Pa., who have been on the payroll since the first of the year received a bonus out of the company's earnings for the past six months.

New Menace of Higher Manufacturing Costs

(Continued from page 89)

the last condition because he has declined an offer of employment in a situation vacant in consequence of a stoppage of work due to, and forming part of, a labor dispute (strikebreaking); an offer of employment in the district (the law would divide the State into districts) where he was last ordinarily employed, such offer being at a rate of wage lower, or on conditions less favorable than those which he habitually obtained in his usual employment in that district; or an offer of employment in another district at a rate of wages lower, or on conditions less favorable than those generally observed in such district in the industry to which the offer relates.

The workman is disqualified while a resident outside of the State; if his unemployment is due to sickness or disablement; if he has lost his employment through his own fault or voluntarily leaves his employment without reasonable cause, such disqualification to last for six weeks. Furthermore, he is disqualified

if he has lost his employment by reason of the stoppage of work which was due to, and a part of a labor dispute at the factory, workshop or other premises where he is employed, and in such event disqualification shall last as long as such stoppage continues as a part of such dispute, except in a case where he has, during the stoppage of the work, become *bona fide* employed elsewhere in an insured trade for at least three weeks.

Such disqualification shall not extend to workmen engaged wholly in an occupation different from the one in which the dispute occurred, whether carried on in a separate building or not, provided that the workmen in such different occupation have not become a party to the labor dispute either directly or sympathetically.

STRIKEBREAKING RULED OUT

These provisions regarding employment and labor troubles appear to mean that a workman would not be required to accept employment as a strikebreaker, nor would he be deprived of insurance benefits if he had been thrown out of work because of a strike in other trades. But as a striker, directly or sympathetically, he would not be entitled to benefits unless meanwhile he should go to work elsewhere.

Provisions are made for refunding contributions under certain conditions. Workmen who had contributed for twenty-six weeks or more if they had left the State for more than a year would receive back the amount of the premiums they had paid in, less the amount of whatever benefits they had received.

The old-age pension idea creeps into the measure in the provision that if a workman had paid contributions for 500 weeks and had reached the age of 60, his contributions, minus what he had received in benefits, would be refunded, with compound interest at 3 per cent. The same provision is made for the case of a man who was over 50 when the act went into effect, although the 500 payments had not been made.

The unskillful and ignorant workman in a trade is provided for. If it should appear to the insurance commissioners that repeated failure to obtain and retain employment was due wholly or partly to defective skill and knowledge, arrangement might be made for a test in order that it might be determined what was suitable employment for this particular man. If it were found that the defect could be remedied by technical instruction, the insurance fund might be drawn upon to provide it, if by so doing the charge on the fund might be decreased.

Some employers may look askance at the section providing that the commissioners "on application of any association of workmen in an insured trade, which provides payment to unemployed members, shall arrange, instead of paying benefits under the general provisions of the act, to pay into the treasury of such association periodically out of the unemployment fund such sum as shall be equivalent to the aggregate amount which such workmen would have received in the way of benefit under the act during periods of unemployment. But in no case shall this amount exceed three-fourths of the amount of the payments made by that association during that period to its unemployed members resident in the State."

Potash Manufacture at Buffalo

In further reference to the article in THE IRON AGE, June 29, 1916, on "A Potash Plant at Buffalo," the following description of the process will be of interest:

The raw materials used are feldspar rock, calcium chloride, limestone, and coke. These are charged into a water-jacketed blast furnace of the standard copper-smelting type, having a 42 x 120-in. hearth. Two products are obtained: Potassium chloride, averaging over 80 per cent KCl, commonly known as muriate of potash, and a slag from which a hydraulic cement is made. The feldspar rock used is a silicate of alumina and potash, averaging 12 per cent K₂O. The chlorine of the calcium chloride combines with the potassium at a temperature of 1100 to 1400 deg. C., and passes out at the top of the furnace as a fume, which is collected in cyclone dust collectors and a gas washer. The limestone is added to flux the silica and alumina in the feldspar rock, and also the ash of the coke, forming a slag which is tapped from the furnace, granulated and manufactured into hydraulic cement. Over 90 per cent of the potash in the charge is recovered in the form of potassium chloride, and of that amount 80 per cent is collected in the dry collectors and 20 per cent in the washer.

Highest Puddling Rate Since 1866

The examination of sales sheets of bar iron mills working under the Amalgamated scale, made at Youngstown, July 11, showed that the average price on shipments of iron bars in May and June was 1.85c. At mills under the Amalgamated sliding scale this price entitles puddlers to a rate of \$8.40 per ton for July and August, against \$7.42½ per ton in May and June. Finishers will receive an advance of about 10 per cent. These are the highest wage ever paid for puddling and finishing since November, 1866, when \$9 was received for puddling for a period of 30 days under the sliding scale. At that time bar iron sold at \$112 a ton.

It was announced Monday that the adjourned bar iron conference will be held next week in Detroit. The union puddlers ask that the base rate be increased 15 per cent over the 1915-1916 agreement. James H. Nutt of Youngstown, secretary of the Western Bar Iron Association, will represent the manufacturers, while John Williams of Pittsburgh will head the Amalgamated Association conferees.

A person unknown to Barker, Chadsey & Co., 38-40 Westminster Street, Providence, R. I., jobbers in mill supplies and hardware, is representing himself as Mr. Barker of that firm, and has obtained money under this false pretense from firms in Brooklyn, N. Y., and Columbus, Ohio.

Recent surveys of the iron deposits in the basin of the river Telbess, and of those in the so-called Temir-Tau district in Siberia, indicate the presence of 27,000,000 tons of iron ore, averaging from 54 to 58 per cent iron for a large part of it.

OBITUARY

HOLLINSHEAD W. TAYLOR, senior member of the firm of N. & G. Taylor Company, manufacturer of tin plate, Philadelphia, Pa., died suddenly of heart disease Friday, July 7, 1916, at his residence, Chestnut Hill, Philadelphia. He was born in Philadelphia in 1850 and is survived by his widow and two children. He was a member of the Union League of Philadelphia, the Down Town Club and the Philadelphia Cricket Club. He was the last of the third generation of Taylors connected with this old company, established in 1810 by his grandfather, William Taylor, and his great uncles, George and Tracy Taylor. He began his connection with the firm under his father, and his business activity in this line falls just short of half a century. It is an interesting fact that the art of tinning was introduced into England about the year 1720 by one of Mr. Taylor's ancestors, Major John Hanbury, of the Hanbury-Tracy family, at Pontypool, Wales, who established the first permanent plant for the production of tin plate on British soil. When the McKinley tariff made possible the production of tin plate in this country about 1891, the firm of N. & G. Taylor Company, composed of Hollinshead W. Taylor, his brother Nathan A. Taylor and his second cousin George W. B. Taylor, immediately made the necessary arrangements to manufacture high grade tin plate, the equipment and processes being transplanted bodily from Wales, thus affording a rather striking historical parallel—their forebear Major Hanbury having been the pioneer of the industry in the mother country. The business will be continued under the same name by the surviving partners, Hollinshead N. Taylor, his son and William W. Justice.

GEORGE BOULTON, a pioneer steel manufacturer of Pittsburgh, died at the residence of his daughter at Ardsley-on-the-Hudson, N. Y., early Sunday morning, July 9. He was 82 years of age, and his death was caused by heart failure. Mr. Boulton was a boyhood friend of Andrew Carnegie, and the two worked together for the Pennsylvania Railroad in their youth. When the Pittsburgh & Connellsville Railroad, which subsequently became the Baltimore & Ohio, was completed, Mr. Boulton was the first agent in Pittsburgh. In 1865 Mr. Carnegie, David A. Stewart and others organized a company to develop oil lands in Venango County and sent Mr. Boulton to the field as superintendent. For 16 years following he was in the oil country. In 1885 he returned to Pittsburgh, and with his brothers, Alexander and Daniel Boulton, brought the first natural gas to the Pittsburgh district, supplying the Edgar Thomson steel works at Bessemer. He was president of the Acme Gas Company until, with Park Brother Company, Ltd., and others, he financed and built the works of the Allegheny Bessemer Steel Company at Duquesne, Pa., now the Duquesne works of the Carnegie Steel Company, of which he was president. When reorganization of the corporation was effected, and the Duquesne steel works succeeded the first-named concern, he was made vice-president and superintendent, which position he held until his retirement from active business in 1895. Mr. Boulton leaves a widow, two daughters and one brother.

DANIEL EDMUND GARRISON, president of the Corrugated Bar Company, St. Louis and Buffalo, N. Y., and also interested in the Columbia Incandescent Lamp Company, died Tuesday, July 4, at St. Louis, Mo., at the age of 76 years after a short illness. He was born at Sharpsburg, Pa., but removed with his parents to St. Louis. In 1869 he took charge of the Kingsland Iron Company, which was later merged with the Vulcan Steel Company, becoming vice-president and general manager. He leaves one son, Arthur C. Garrison.

CHARLES L. F. ROBINSON, president of the Colt's Patent Fire Arms Mfg. Company, Hartford, Conn., died suddenly during the night of July 5 on board his yacht near Newport, R. I. He had not enjoyed good health since 1913, in which year he was severely injured in an automobile accident, suffering a dislocation of the

vertebrae of the spine. Mr. Robinson was born July 3, 1874, in Sayville, Long Island, N. Y., and was graduated from Sheffield Scientific School, Yale University, in 1895. He had been a resident of Hartford for ten years. He was a director of the American Hardware Corporation, New Britain; the Standard Wrench Company, Providence, and of many financial institutions and insurance companies of his home city.

HARRY E. FLEWELLIN, who was connected with the sales department of the International Nickel Company for twelve years, died in Caldwell, N. J., June 26. He had been in ill health for nearly two years.

Lackawanna Steel Company's Earnings

The rate of profit earned by the Lackawanna Steel Company and subsidiary companies for the second quarter of this year was 35.31 per cent on the \$34,750,000 of common stock outstanding. For the half year the rate of profit is 30.61 per cent. The unfilled orders on June 30 amounted to 932,857 gross tons, against 283,979 gross tons one year ago. A comparative statement of the income account is as follows:

<i>Income Account, Second Quarter</i>			
	1916	1915	Increase
Total net earnings after deducting all expenses, including ordinary repairs and maintenance	\$4,051,833.47	\$1,152,044.84	\$2,898,988.63
Deduct:			
Interest on bonds, debentures and notes:			
Lackawanna Steel Company	368,833.34	402,500.00	
Subsidiary companies	75,829.18	77,475.00	
Rentals and royalties	25,359.00	25,359.00	
	470,021.52	505,334.00	
Balance	3,581,011.95	646,710.84	2,934,301.11
Less:			
Appropriations:			
For extinguishment of mines and mining investments..	82,597.51	74,654.43	7,943.08
For depreciation and accruing renewals	431,140.74	303,672.17	127,468.57
	513,738.25	378,326.60	135,411.65
Profit for second quarter	3,067,273.70	268,384.24	2,798,889.46
<i>Income Account, First Half</i>			
	1916	1915	Increase
Total net earnings after deducting all expenses, including ordinary repairs and maintenance	\$7,298,626.77	\$1,351,888.48	\$5,946,738.29
Deduct:			
Interest on bonds, debentures and notes:			
Lackawanna steel Company	771,333.34	828,283.34	
Subsidiary companies	152,491.68	154,950.00	
Rentals and royalties	50,818.00	50,818.00	
	974,643.02	1,034,051.34	
Balance	6,323,983.75	317,837.14	6,006,146.61
Less:			
Appropriations:			
For extinguishment of mines and mining investments..	154,389.83	107,160.07	47,229.76
For depreciation and accruing renewals	851,251.79	508,051.60	343,200.19
	1,005,641.62	615,211.67	390,429.95
Profit for first half	5,318,342.13	*297,374.53	5,615,716.66

*Loss.

Phenol or carbolic-acid manufacturers in the United States now number 19, turning out an estimated total of 12,000 tons per year. One-quarter is understood to be made by the Barrett Company at Philadelphia. Before the war, the acid used in this country was mostly imported, but the large increase in the benzol output has aided materially in the expansion of the industry.

Atkinson & Utech, Inc., 111 Broadway, New York, have been appointed Eastern sales agents for J. R. Johnson & Co., Richmond, Va., manufacturers of open-hearth steel car axles.

Machinery Markets and News of the Works

MARKET CHANGES EASILY

Resale Machines Causing Little Worry

Makers of Standard Engine Lathes Can Give Fairly Prompt Deliveries—Boring Mills Are Active

With deliveries drawing nearer, and used tools beginning to appear in greater numbers, the transition of the machinery markets from war activity to conditions normal in character continues to go on smoothly. Tool builders are busy on orders yet to be filled, and generally are receiving a satisfactory volume of business, most of which consists of scattered requirements of single machines. From several directions come reports of easiness in engine lathes. Long-established makers are reaching a point where they can make fairly prompt deliveries, and newcomers in the lathe field do not find it so easy to dispose of their output.

The offerings of second-hand tools by munitions makers is not causing much worry. Dealers are inclined to be conservative, in view of these resale machines; but it is yet too early to say just what the effect will be. Some tool builders feel protected against the remarketing of tools which they built and sold, for the reason that they had this contingency in mind when they fixed the war prices for their machines.

Boring mills and grinding machines have moved well in New York. In this city, dealers have been getting considerable export business.

Boring mills have been active in Cincinnati also, while large engine lathes have been in fair demand for large shell work.

Cleveland reports a good demand for single tools and for forging, bolt-and-nut machinery, twenty-five of which were taken for shipment to South America.

The demand in Milwaukee is mostly limited to standard tools.

The lathe situation is a problem with the Chicago trade, as elsewhere. It is pointed out that the supply, including used machines, exceeds the demand.

While the Pacific Northwest is enjoying a period of prosperity, the San Francisco district is harassed by a water-front strike, which it is feared will be followed by more serious labor troubles.

Canada has more millions to spend for munitions.

New York

NEW YORK, July 12, 1916.

Business in the past week was more active than in the preceding one, and the aggregate done by all sellers was satisfactory. One or two selling offices report one of the best weeks since the heavy war buying of a few months ago. Boring mills and grinding machines have been especially active, together with smaller sizes of turret lathes. Conditions are regarded as healthy in view of practically all the domestic demand coming from industrial sources.

The foreign demand continues good, and many orders are being received by dealers who ordinarily do not do much with foreign buyers. The latter continue to look mostly for machines suitable for munitions work. Deals involving shipments to Italy, Russia, France, Spain and Sweden have been made. A cable inquiry concerned six planers on which shipment cannot be made until December or January.

Lathes are easy to procure, largely because of the number of new makes which are being offered. The same is true of small hand screw-machines. Deliveries cannot be had on some makes of large turrets much before November, while others can make prompt shipments. Some newcomers in the machine-tool field are not finding it easy to dispose of their output, largely because they began to manufacture at too late a day. With standard tools deliveries continue to shorten.

Some sellers of machine tools are conservative with regard to the future in view of the offerings of used machines by firms who had war orders, the possibility of cancellations, etc. Where there have been cancellations, and altogether there have been but a few, no difficulty was had in reselling the machines and the only loss was the extra work involved in the second sale. Prices continue firm. Certain firms are not much worried over resales of machines which they disposed of in the flurry of buying which came with the placing of munitions contracts for the reason that they made prices which insured them against the appearance of their machines on the second-hand market.

The Wern Machinery & Engineering Company, 30 Church Street, New York, has placed additional orders for machinery to equip a ball bearing plant in Sweden. Not all the tools required have been purchased.

The Intertype Corporation, manufacturer of typesetting machines, foot of Montague Street, Brooklyn, N. Y., recently incorporated with \$2,650,000 working capital, has purchased for \$1,650,000 the assets of the International Type-setting Machine Company, thereby effecting a reorganization. Charles D. Palmer is president; A. F. J. Wheatley, secretary; H. R. Swartz, treasurer and H. W. Cozzens and H. W. Miller are assistants to the president. W. S. Scudder is superintendent. The board of directors is composed of Charles D. Palmer, Edward D. Adams, Wellington E. Bull, George C. Haigh, Erskine Hewitt, Marsden J. Perry, Henry Ruhlender, William Shillaber and Richard H. Swartwout. It takes over the new and well-equipped plant of its predecessor and the former technical staff.

The Victor Electric Corporation has been incorporated in New York with a capital of \$3,500,000 to consolidate the business and properties of the Victor Electric Company of Chicago and New York, the Scheidel-Western X-Ray Company of Chicago and New York, the Macalaster-Wiggin Company of Cambridge, Mass., and the Snook-Roentgen Mfg. Company of Philadelphia, manufacturers of x-ray apparatus. The details of organization have been managed by Herbert S. Blake & Co., 30 Church Street, New York. The permanent officers will be Charles F. Samms, president; Clinton W. Howe, vice-president; H. Clyde Snook, vice-president; Frank H. Swett, vice-president; Fred A. Wiggin, treasurer; Theodore B. McClintock, secretary and manager of sales; Julius B. Wanta, manager of production; G. Herbert White, assistant treasurer; Edwin W. Kelly, assistant secretary; Herbert S. Blake, chairman of the board of directors. The board of directors will be J. Frederick Hartz, Charles F. Samms, Clinton W. Howe, H. Clyde Snook, Frank H. Swett, Fred A. Wiggin, Theodore B. McClintock, G. Herbert White and Herbert S. Blake.

The Unimac Tool Company, recently incorporated with a capital stock of \$6,000 by D. H. MacBeth, R. J. Bentel, L. E. Matty, has established a plant at 18 Dunham Place, Brooklyn, N. Y., for the manufacture of special automatic machinery, tools, jigs, fixtures, etc.

The C. T. Coe Company, manufacturer of turbine blowers and sectional grates, 10 Johnson Street, Newark, N. J., is increasing its manufacturing space to provide for a needed increase in capacity.

The Eastman Kodak Company, Rochester, N. Y., has purchased 85 acres of land adjoining its plant for \$107,000. Arrangements have been made to connect all the plants at Kodak Park with double-track subways. The property now covers 220 acres.

Samuel W. Moore & Sons, Inc., recently incorporated with a capital stock of \$100,000, has leased a plant at Mulberry and Scott streets, Newark, N. J., for the manufacture of fiber and wood pulp food product containers; but it anticipates building a plant. E. J. Schwarz is president; Samuel W. Moore, vice-president; William Matthews, treasurer, and Arlington Moore, secretary and general manager.

The Cunningham Foundry Corporation, Boonton, N. J., has been incorporated with a capital stock of \$15,000, and

has taken over the plant and business of James S. Cunningham, manufacturer of grate bars, furnace equipment and turbine blowers.

The Pathe Freres Phonograph Company, 29 West Thirty-eighth Street, New York, has increased its capital stock from \$900,000 to \$1,300,000 to provide for the erection of its new plant in Brooklyn.

The Fancher Furniture Company, Salamanca, N. Y., is erecting a three-story addition, 50 x 100 ft. A. T. Fancher is president and John Walrath treasurer and manager. Most of the equipment to be installed has been purchased.

The Bath Harness Company, Bath, N. Y., will rebuild its factory, which was destroyed by fire June 30. New machinery will be installed, which will be operated by individual electric motors. E. K. Derrick is manager.

The National Air Cell & Covering Company, 212 Van Brunt Street, Brooklyn, N. Y., has awarded contract to James Mitchell, 76 Montgomery Street, Jersey City, N. J., for a four-story reinforced concrete factory, 80 x 306 ft., to be erected in South Cove from plans by John T. Rowland, Jr., 100 Sip Avenue, Jersey City, to cost about \$100,000. It is in the market for engines, boilers and hydraulic presses.

The Morrow Mfg. Company, Elmira, N. Y., has let contract to the William R. Compton Realty & Construction Company, 201 Lake Street, Elmira, for the construction of unit No. 49 at its plant, one story, 370 x 1000 ft., to cost about \$150,000. Rhines & Bellman & Nordoff, Ohio Building, Toledo, Ohio, are the architects and engineers. J. E. Morrow is secretary.

The Adriance Machine Works, Inc., 254 Van Brunt Street, Brooklyn, N. Y., manufacturer of can-making machinery, presses, etc., has purchased a block fronting 200 ft. on Richards Street and 400 ft. on Verona and Delevan streets. The company originally intended to erect an eight-story unit with a one-story erecting shop 50 ft. wide through the center; but owing to the high cost of labor and materials, it will probably modify this plan and construct a ten-story building, 100 x 200 ft., on Richards Street, with a one-story erecting shop, 50 x 100 ft., in the center at the rear. It will concentrate its several scattered plants in this new building. All equipment will be individually motor driven. F. H. Morse is secretary and treasurer.

The Jersey City Metal Treating Company, recently incorporated with a capital stock of \$100,000, has established headquarters at 210 Randolph Street, Jersey City, N. J. H. J. Whittaker, Philadelphia, Pa., is president and J. C. Sandmeyer, Jr., Newark, N. J., is secretary and treasurer. It will do annealing, case hardening, hardening and tempering, and heat treating.

The Reliance Architectural Iron Works, 251 Monitor Street, Brooklyn, N. Y., plans to build a new shop, 40 x 60 ft., to constitute a new structural bay in its present plant. It is installing several structural machines. O. J. Bloss is proprietor.

The Mica Insulator Company, Schenectady, N. Y., suffered a loss by fire of about \$3,000, which put about half of its equipment temporarily out of use. C. W. Jefferson is manager.

William Bartley & Sons, Inc., manufacturer of portable sawmills, gray-iron castings, etc., contemplates building a one-story stone machine and pattern shop, 27 x 87 ft., to replace its two-story plant which was recently burned down. J. F. Parliment is treasurer.

The H. & N. Carburetor Company, recently incorporated with a nominal capital of \$1,500, has established its office at 1790 Broadway, New York City, and has located its factory at Loraine, N. J. It maintains a service station at 38 West Sixty-second Street, New York. W. H. de Fontaine is president and treasurer; A. Ross Jarman, vice-president, and Elmer Pontin, secretary.

New England

BOSTON, MASS., July 10, 1916.

The New Haven Lines have been obliged to extend the partial embargo, which was put in force at the time of the heavy troop movements, until July 12. Most manufacturers are now so well stocked that no serious trouble is expected from the continuance of the embargo.

Landers, Frary & Clark, New Britain, Conn., have had plans drawn for an addition, 60 x 150 ft., two stories, which will be devoted to the celluloid work, used in connection with their extensive line of cutlery and other products.

Work has been begun on a factory, 110 x 200 ft., to be erected on Freight Street for the American Brass Company, Waterbury, Conn.

The Chapman Mfg. Company, Boston, Mass., has been incorporated with capital stock of \$400,000 to manufacture mill machinery. The directors are Daniel J. Shea, president; Alton F. Tupper, Arlington, treasurer, and D. L. Wilson.

The Automatic Advertising Machine Company, Boston, Mass., has been incorporated with capital stock of \$50,000. The directors are S. D. Brown, president; J. Colby Stevens, Malden, treasurer; and George E. Smith.

The Graton & Knight Mfg. Company, Worcester, Mass., has bought land adjoining its present property to provide for future plant expansion.

The Bryant Electric Company, Bridgeport, Conn., has reduced its capital stock from \$2,500,000 to \$2,000,000.

Philadelphia

PHILADELPHIA, PA., July 10, 1916.

The Rogers Construction Company, Gloucester City, N. J., is erecting a plant for the manufacture of aeroplanes. The first unit, which will have a floor area of 18,000 sq. ft. with a frontage on the Delaware River opposite League Island Navy Yard of 165 ft., will be of steel and concrete and is to be completed by Sept. 1. It will be used exclusively as an erecting shop. All necessary machine work will be subcontracted for by the John M. Rogers Works, Inc., whose machine shops adjoin the aeroplane plant. F. C. Rogers is in charge.

The Bonney Vise & Tool Works, Allentown, Pa., is erecting the first building on its new site. It will be of brick and stone, one story, 65 x 160 ft., and will cost about \$15,000. It is to be used as a drop forge shop. The old plant will be continued for some time, although ultimately the company may move its entire business to the new site. Fred S. Durham is vice-president.

The Chester Shipbuilding Company, Front and Kerlin streets, Chester, Pa., is understood to be planning the construction of two additional shipways, which will bring the total number up to seven and a 40 x 200-ft fitting-up wharf. The company may also bulkhead the property.

The foundations for the fabricating plant of the new Sun Shipbuilding Company, Third Street and Delaware River, Chester, Pa., have been completed and the main structure started. The Raymond Concrete Pile Company is working on the five shipways which will extend to the pier-head line. Announcement has been made that in addition to the buildings already planned, a boiler-shop will be erected and the plant of Robert Wetherill & Co., Inc., which is owned by the shipbuilding company, and which will be used for the manufacture of machinery and engines, will be considerably enlarged.

The Pyrites Company, Ltd., Wilmington, Del., will erect a pumphouse at the foot of Christiana Street and an office and storeroom.

The New York Shipbuilding Company, Camden, N. J., is building an extension to its machine shop, 131 x 169 ft., one story. It has awarded the structural contract to the McClintic-Marshall Company, Oliver Building, Pittsburgh. Work will be started shortly. L. D. Lovekin, Broadway and Fairview Street, Camden, is chief engineer. H. A. Magoun is vice-president.

The B. F. Boyer Company, Camden, N. J., has had plans drawn by Ballinger & Perrot, architects, Philadelphia, for factory alterations and additions.

John Rich & Bros., Woolrick, Pa., have awarded contract to the Hughes & Foulkrod Company, Philadelphia, for the erection of a four-story brick and concrete factory, 81 x 100 ft.

Directors of the Harrisburg Foundry & Machine Works, Harrisburg, Pa., have called a meeting of stockholders for July 18 to vote on a proposed increase in debt of from \$300,000 to \$600,000.

The Covell Belting Co., Pittsburgh, with a capital stock of \$5,000, has been incorporated by W. B. Covell, 41 North Seventh Street, Philadelphia; W. J. Fisher, 2543 North Corless Street, Philadelphia, and Thomas M. Scott, 4934 Cedar Avenue, Pittsburgh, to manufacture transmission belting.

The Philadelphia Brass Company, Philadelphia, has been incorporated with a capital stock of \$6,000 by Walter Scott Johnson, Bryn Mawr, Pa.; Charles E. Anthong, Wayne, Pa., and F. Cooper Pullman, Wyncottem, Pa., to manufacture brass, copper, zinc and nickel. William E. Chickering, 3213 Clifford Street, Philadelphia, is treasurer.

The Neolithic Products Company, Philadelphia, has been incorporated with a capital stock of \$25,000 by Agostino Barber, 5414 Parkside Avenue, to manufacture pavements, ceilings, etc., from minerals and metal.

The Kay Jewelry Company, Reading, Pa., has been in-

incorporated with a capital stock of \$10,000 by Saul Kaufmann, Edmund I. Kaufmann and Warren H. Rothermel to manufacture jewelry.

The Philadelphia Table Company, Philadelphia, has been incorporated with a capital stock of \$6,500 by Frank Chabrow and Abraham Foyer, 3221 Turner Street; Charles Zolot, 1318 North Sixth Street, and Morris Zolot, 1002 North Marshall Street, to manufacture tables and other furniture.

The Nyphen Furniture Company, Warren, Pa., has been incorporated with a capital stock of \$25,000 by Oscar R. Pang, 234 Falconer Street, Jamestown, N. Y.; Theodore Shellberg, 430 Winsor Street, Jamestown, N. Y., and R. Z. Morrison, Hickory Street, Warren, Pa., to manufacture wood and metal furniture.

The Lancaster Piano Company, Lancaster, Pa., has been incorporated with a capital stock of \$10,000 by John Wirth, 118 Ruby Street, Lancaster; C. H. Brubaker, 720 First Street, Lancaster, and J. E. Shaub, Millersville, Pa., to manufacture musical instruments.

Baltimore

BALTIMORE, MD., July 10, 1916.

The Chesapeake Mfg. Company, Light and Poultney streets, Baltimore, manufacturer of furniture, will install motors at 429 to 439 South Sharp Street and use the property as a wood-working establishment.

The business of John Hubert, coppersmith, 1714 Thames Street, Baltimore, has been incorporated with \$15,000 capital under the name of the John Hubert Coppersmith & Plumbing Company.

Plans are being prepared for a hotbed foundation at the plant of the Hess Steel Corporation, Biddle Street and Loney's Lane, Baltimore.

Work is progressing rapidly on the new buildings of the Baltimore Car & Foundry Company, Curtis Bay, Md., subsidiary of the Standard Steel Car Company, Pittsburgh. The rolling mill will be 220 x 700 ft. There will be large machine and pattern shops.

Chicago

CHICAGO, ILL., July 10, 1916.

The machine-tool trade is chiefly concerned with the problems to be faced as conditions begin to reverse themselves in the relations of demand to the production of machinery. This is particularly and already true with respect to lathes. The very largest increased production of lathes has been continued after the period of greatest demand, and not only is there now in prospect a return of these lathes to the market, but new lathes are being offered for very early delivery, in some instances, at practically standard prices. As for the special purpose tools, of which there has been such a large production and which are now being released from service by the completion of ammunition contracts, it already seems probable that their marketable value will not greatly exceed their valuation as scrap. A marked shortage of other forms of standard tools, such as milling machines, is still general.

A feeling of caution has developed in the trade in second-hand machinery, and some dealers are making purchases and trades involving the acceptance of steel tools only on the basis of the prices of two years ago. The prospect of the release of equipment of standard character in the closing up of some ammunition plants is bringing out inquiry from manufacturers who hope to find single tools of which they have need. Among the railroads recent buying has been limited to the closing by the Santa Fe of orders for a number of power and steam hammers and the purchase of a large lathe by the Monon.

The Monmouth Plow Factory, Monmouth, Ill., is in the market for a 200-lb. helve hammer.

The Chippewa Foundry & Machine Company, Chippewa Falls, Wis., has increased its capital stock from \$25,000 to \$100,000 and will build a factory at Chippewa Falls, 60 x 230 ft. The company was not reorganized as has been stated. It manufactures a steady stream pump.

The Sulzberger & Sons Company, Forty-first Street and Ashland Avenue, Chicago, will build a five-story box factory, 67 x 141 ft., of mill construction, to cost \$75,000. Bids are being received by C. T. Barnett, chief engineer.

W. J. Bryson, 747 Buena Avenue, Chicago, will build a two-story garage, 200 x 295 ft., to cost \$5,500.

The Humboldt Stair Works, 1616 North Richmond Street, Chicago, will build a one-story factory, 32 x 113 ft., in North Crawford Avenue, at a cost of \$5,000.

The Regal Model & Tool Works, 122 South Clark Street, Chicago, J. T. H. Patterson, proprietor, advises that its new plant at 1143 Diversey Parkway, will open about Aug. 1.

It will be equipped to manufacture special machinery, dies, tools and automobile parts.

The Electric Alloy Steel Company, Thirty-fourth Street and Hoyne Avenue, Chicago, Ill., has changed its name to the Trojan Electric Steel Company.

The Moore Brothers Company, Joliet, Ill., is adding to its plant a one-story brick shop, 50 x 330 ft., to provide necessary increase in manufacturing capacity.

The Comet Automobile Company, Rockford, Ill., is planning the erection of a factory building. Harry R. Sackett is president.

The Hayes Pump & Planter Company, Galva, Ill., has placed contracts for the erection of an addition to its factory which will add 50,000 sq. ft. of floor space.

The M. & N. Automatic Spark Plug Company, Cedar Rapids, Iowa, has been organized with a capital of \$100,000 to manufacture automobile spark plugs. A factory site has been obtained. A. E. McDaniel is president.

The Cooper Foundry Company, Atchison, Kan., recently organized by Charles Cooper of St. Joseph, plans to build a foundry.

The Moline Plow Company, Moline, Ill., has contracted with the Stone & Webster Corporation for the immediate construction of a large foundry and tractor works on its premises in Rock Island, Ill., where its wood shop is located. The foundry will be 180 x 360 ft., besides a room for cleaning castings, a corerom, pattern vault and cupola. A machine shop, 100 x 800 ft., is also to be completed as soon as possible, to meet the heavy demand for tractors, which is overtaxing its present tractor shop capacity. Frank Gates Allen is vice-president and general manager.

Cleveland

CLEVELAND, OHIO, July 10, 1916.

Deliveries on some lines of machine tools continue to improve, particularly on lathes, some manufacturers now being able to make fairly prompt shipment. A fair volume of business is coming out for standard machines; but orders are almost wholly for single tools. The buying is very scattered. The demand for forging machinery continues active. A Cleveland manufacturer recently took an order for about 25 forging and bolt and nut machines for railroad shops in South America. The demand for cranes has eased off somewhat on account of delayed deliveries and the falling-off in factory building construction. Crane builders are from six to twelve months behind on deliveries.

The Taylor Machine Company, Carnegie Avenue, Cleveland, maker of automobile parts, will enlarge its plant by the erection of an extension, 40 x 130 ft., two stories. Some additional equipment will probably be required.

Arthur G. McKee & Co., Cleveland, will erect a two-story brick and steel warehouse and factory building, 75 x 200 ft., on St. Clair Avenue, near the Belt Line Railroad.

The General Model & Pattern Company, Cleveland, has been incorporated with a capital stock of \$10,000 by C. H. Jansen, Henry Kaiser, and others.

The Ohio Steel Foundry Company, Lima, Ohio, is having plans prepared for extensions that will double the capacity of the plant. It recently purchased the foundry of the Bucyrus Steel Castings Company, Bucyrus, but in spite of these increased facilities finds that it needs additional factory space. The capital stock has just been increased from \$600,000 to \$800,000.

The Hester Tire & Rubber Company, Cleveland, will build a plant in Lima, Ohio, where it has been provided with a 3-acre site. The plans call for a two-story brick building, 50 x 100 ft., and a powerhouse, 60 x 60 ft.

The Wolf-Lanning Clay Company, Uhrichsville, Ohio, recently incorporated with a capital stock of \$15,000, will build a plant to manufacture sewer pipe and brick. The plans call for a three-story brick drying house, 112 x 256 ft., an annex in which the machinery will be located and a power house.

The plant of the Kressler Auto Company, Fostoria, Ohio, was burned a few days ago at an estimated loss, including machinery, of \$25,000.

The Gachwind Furnace Company, Youngstown, Ohio, manufacturer of warm-air furnaces and ventilating systems, will move to Warren, Ohio, where it has purchased a part of the Day-Ward plant.

The Chevrolet Motor Company, Flint, Mich., has purchased the plant of the Wagner Mfg. Company, Toledo, Ohio, and will use it to manufacture transmissions and gears.

The Denison Foundry & Machine Company, Denison, Ohio, is being operated under new management. The officers

are: W. K. Eckfeld, president; E. R. Van Ostran, vice-president; Thomas Wright, treasurer, and F. E. Latto, secretary.

The Advance Machinery Company, Defiance, Ohio, has partly completed plans for the establishment of a plant at Sheboygan, Wis., to manufacture its line of wood-working machinery.

Cincinnati

CINCINNATI, OHIO, July 10, 1916.

Rubber tire manufacturers have lately bought a number of boring and turning mills. The larger-sized lathes are also in demand; but only single purchases are being made. The call for these machines is from munitions manufacturers who are figuring on taking extra contracts for finishing a large quantity of high-explosive shells for the British Government; the forging contracts for these were let to nearby companies two weeks ago. The activity of the auto-truck manufacturers has to a considerable extent affected makers of accessories. The Highland Body Mfg. Company, of Cincinnati, reports the receipt of a rush order for 100 truck bodies, with other business pending, while the Troy Wagon Works, Troy, Ohio, is working on two orders that will total 400 bodies for 1½-ton trucks.

Light electrical equipment of all kinds is in excellent demand. This applies especially to portable electric tools and to small motors. Foreign orders for portable drilling machines continue to come in and domestic business is also good. The boiler and tank business is somewhat handicapped on account of the present high prices of plates.

The Cincinnati Planer Company, Oakley, Cincinnati, Ohio, will require a number of small electric motors, one electric traveling crane and case-hardening outfits. Its proposed building will be used mainly for warehouse purposes.

It is currently reported that the Sayers & Scoville Company, Cincinnati, vehicle manufacturer, has taken a lease on a building at Bank and Patterson streets. Its former plant on Colerain Avenue was destroyed by fire several months ago.

The Ault & Wiborg Company, Cincinnati, ink manufacturer, has decided to erect two additional structures to its chemical plant in St. Barnard, so that the total number of buildings will be at least eight, not including the power plant.

The Cincinnati Iron & Steel Company, Cincinnati, has taken out a permit for a garage to be erected near its plant on Freeman Avenue. A small repair shop will be provided.

The Union Gas & Electric Company, Cincinnati, has let contract for a power plant to be constructed on Fourth Street.

The Dietz Mfg. Company, Cincinnati, has been incorporated by William C. F. Dietz, Fred Dietz, and others, with \$10,000 capital stock. Later on the company expects to establish a plant for the manufacture of a patent washing machine.

The Davis Sewing Machine Company, Dayton, Ohio, is having plans prepared for an addition to its plant, most of which will be used as a drop forging department. Details as to the size of the plant contemplated and equipment wanted are not yet available.

The Hooven, Owens, Rentschler Company, Hamilton, Ohio, recently received an order from the Cambria Steel Company for a 3500-hp. low-pressure steam engine.

The Swantz Mfg. Company, Hamilton, Ohio, recently suffered a fire loss of approximately \$3,000 to its cotton felt plant. Rebuilding operations will begin immediately.

Work is progressing rapidly on the plant of the Central Ohio Paper Company, Columbus, Ohio. The new building will be 140 x 200 ft., five stories, of reinforced concrete.

The Excelsior Seat Company, Columbus, Ohio, has made an addition to its factory that will be used for the manufacture of motor ambulance bodies.

Plans have been completed for an addition to the plant of the Mohrlite Company, Urbana, Ohio, 65 x 100 ft., two stories, of brick and concrete.

A bond issue of \$43,000 has been recommended by the municipality of St. Mary's, Ohio, to be used in the construction of a water and electric lighting plant.

The Ironton, Ohio, plant of the Standard Slag Company, Youngstown, Ohio, was almost completely destroyed by fire July 7. It will be rebuilt at an early date.

The Shanklin Mfg. Company, Springfield, Ohio, advises that the construction of its new building is under way and some of the machinery equipment purchased. It does metal stamping and makes screw machine products.

Milwaukee

MILWAUKEE, WIS., July 10, 1916.

The past week showed smaller production than usual because of the holiday, which in some cases was extended from Saturday noon until Wednesday morning. A lull in transactions was also noted and not much new business was placed, which is not unusual for this season. Production, however, has not felt any appreciable effect of a slackening demand, as capacity is still well taken up on old orders, in the machine tool line especially. Practically all of the business done is for standard types, and the call for special tools has dwindled to almost nothing. Deliveries have been easy, as the high pressure is no longer evident and the average is rapidly being reached.

The Rotary Gas Engine & Pulverizer Company, Antigo, Wis., has filed articles of incorporation with a capital stock of \$25,000 to manufacture power implements for farm use. The incorporators are Charles Frieders, Clarence Rishel and W. A. Maertz.

The Hugh Agner Auto Company, Burlington, Wis., will build a new garage and machine shop, costing \$15,000, of solid brick, one-story and basement, 59 x 165 ft. The present garage has been sold to the Cunningham Brothers Company, Burlington, who will use it for garage purposes after Jan. 1, 1917.

The G. A. Kraemer Company, Elkhart Lake, Wis., is building a machine shop addition, 60 x 40 ft., to its garage, to be ready July 31.

The Robert Rom Company, manufacturer of plumbing supplies, 1023 St. Paul Avenue, Milwaukee, is the company which will build the new foundry at Sixty-third Avenue and Burnham Street, West Allis, now being planned by Carl Barkhausen, architect, 408 Iron Block, as noted recently.

The sheet-metal works operated at Fond du Lac, Wis., for several years by Edward MacIntyre and Nelson A. McDonald has been incorporated under the style of MacIntyre-McDonald Company, with a capital stock of \$5,000.

The Turbine Sewer Machine Renovating Company, Eleventh and Wells streets, Milwaukee, has awarded contracts for the erection of a machine shop addition, 30 x 65 ft. Philip A. Fuchs is president.

E. A. Hammes, Madison, Minn., has purchased the machine shop of Emil Koehler at Bangor, Wis., and will take immediate possession.

The Updike Grain Company, Omaha, Neb., has leased the grain elevator now being erected by the Chicago & North Western Railroad Company at the foot of Kinnickinnic Avenue, Milwaukee, at a cost of \$850,000. Considerable equipment will be purchased later. The capacity of the elevator is from 1,500,000 to 2,500,000 bu.

Dodd & Churchill, Osceola, Wis., have broken ground for a garage and machine shop to cost about \$6,500.

The Corliss Motor Truck Company, organized recently at Corliss, Wis., with \$100,000 capital, has re-equipped part of the former plant of the Wisconsin Engine Company, and is now producing a light delivery truck, selling for \$650 and \$695, depending upon the body style. Harry Mohr, formerly of Chicago, is in charge.

The Advance Machinery Company, Toledo, Ohio, manufacturing wood-working machinery, has accepted the proposition of the Industrial Building Association, Sheboygan, Wis., and will establish a plant consisting of three new buildings at Union Avenue and Nineteenth Street. Plans are being prepared by Juul & Sixta, architects, Imig Building, Sheboygan.

Grover McGeehan and H. L. Everson, proprietors of R. J. McGeehan & Son Company, DePere, Wis., machinery and implement jobbers and dealers, have sold the business to Elmer McGeehan, who will continue the business without any change.

George H. Ridell, Sheboygan, Wis., until recently superintendent of the American Mfg. Company, Sheboygan, Wis., is organizing a \$25,000 corporation to establish a plant for the manufacture of fiber furniture and similar goods from waste paper.

O. A. Young, Stevens Point, Wis., who erected a garage and service station on Strong's Avenue last spring, has awarded contracts for the erection of a machine-shop addition, 24 x 70 ft.

The Wisconsin Seating Company, New London, Wis., has taken a large contract for the manufacture of phonograph cabinets from the Edison interests and will discontinue the manufacture of chairs, with the exception of theater and school equipment. The order will require capacity operations for more than one year and the erection of additional dry kiln and finishing facilities.

Indianapolis

INDIANAPOLIS, IND., July 10, 1916.

The Indiana Die Casting Company, Indianapolis, will build a reinforced concrete addition to its plant, 45 x 85 ft. Die casting machinery will be purchased.

The Warner Implement Company, Hammond, Ind., has been organized with a capital of \$35,000 by Frank Hammond, Giles Warner and W. F. Bridge, to build agricultural machinery.

The Lavelle Foundry Company, Anderson, Ind., has taken over the buildings of the Star Machine Company and plans to operate the plant as a foundry, installing equipment to the value of \$10,000.

The Dearborn Concretile Company, Aurora, Ind., has been incorporated with \$5,000 capital stock to manufacture tools, machinery and electrical devices. The directors are Edward Sutton, James H. Truitt and Harry L. Nowlin.

The Studebaker Municipal Utilities Company, South Bend, Ind., has been incorporated with \$100,000 capital stock to manufacture street sweepers, cleaners, etc. The directors are Frederick S. Fish, A. R. Erskine and A. B. Thielens.

The Evansville Edge Tool Works, Evansville, Ind., is working on contracts to supply the British Government with large shears for cutting wire entanglements.

The R. H. Maple Company, Indianapolis, has been incorporated with \$50,000 capital stock to manufacture electrical goods. The directors are Virgil H. Lockwood, Ralph G. Lockwood and Roy H. Maple.

The Ideal Veneer & Lumber Company, Franklin, Ind., has been incorporated with \$40,000 capital stock to manufacture lumber. The directors are James H. McCrea, Minor W. Davis and Wilford Hill.

The St. Joseph Heating Company, South Bend, Ind., has increased its capital stock from \$100,000 to \$200,000.

The Great Western Mfg. Company, Laporte, Ind., has been incorporated with \$500,000 capital stock to manufacture automobiles and aeroplanes. The directors are C. A. and E. J. Lonn.

Detroit

DETROIT, MICH., July 10, 1916.

The Detroit Insulated Wire Company, Detroit, has increased its capital stock from \$500,000 to \$1,000,000.

The plant of the William Horner Flooring Company, Reed City, Mich., was recently damaged by fire to the extent of \$20,000. It will be rehabilitated at once.

The Michigan Electrochemical Company, Menominee, Mich., has been incorporated with \$150,000 capital stock to manufacture chemicals. The incorporators are Edward Daniell, R. T. Goodman and C. W. Gram. Plans for a plant are being prepared.

The L. O. Gordon Mfg. Company, Muskegon, Mich., has been organized by a syndicate of Cleveland and Muskegon capitalists to manufacture automobile parts. The erection of a plant to cost \$100,000 will begin at once.

The Morton Salt Company, Port Huron, Mich., is erecting an addition to its plant, 160 x 300 ft., to be used as a grainer.

The Home Furnace Company, Holland, Mich., has awarded a contract for its plant. The main building will be 100 x 250 ft., and cost \$17,000.

The Central South

LOUISVILLE, KY., July 10, 1916.

Business requirements continue large in the Louisville territory and the manufacturing and distributing trades report no indication of a let down. Increased demands for construction machinery are noted. Electrical needs are equally generous and deliveries are invariably set ahead from two to three months. Requirements in the way of flouring mill equipment and repairs have been large and contractor's equipment is in large demand.

Major Theodore B. Hacker, in charge of the United States Quartermaster's depot at Jeffersonville, Ind., is receiving bids on large quantities of hand tools until July 14 and for parts for escort wagons until July 13. Contracts for escort wagons have been given the Kentucky Wagon Mfg. Company, Louisville, the Thornhill Wagon Company, Lynchburg, Va.; the John Deere Company, Moline, Ill., and for ambulances to the Studebaker Corporation, South Bend, Ind. The Dow Wire & Iron Works, Louisville, and the Mesger Iron Company, St. Louis, Mo., divided a contract for 10 army field bakeries, valued at \$27,000.

Proposing to engage in the manufacture of oxygen, hydro-

gen and other gases, the Kentucky Oxygen Hydrogen Company, Louisville, has been incorporated with \$50,000 capital by H. G. Offut, F. H. Goodridge and Walter H. Girdler.

C. R. Mengel, C. C. Mengel and C. C. Mengel, Jr., are incorporators of the Axim Transportation Company, with \$5,000 capital listed, debt limit \$750,000, to build and operate ocean-going freight steamers.

The National Foundry & Machine Company, headed by Adam Vogt, will largely increase its plant at Fifteenth and Main streets, including erection and equipment of three additional buildings at an estimated cost of \$200,000.

The Nashville Machine Company, Nashville, Tenn., represented by C. C. Holt, is installing machinery in the new axe handle factory at Bowling Green, Ky. A new 200-hp. Corliss engine is included.

The Louvera Cotton Mills Company, Trenton, Tenn., is building a cotton gin, to have four 70-saw ginheads, a hydraulic press with automatic tampers, operated by steam.

J. G. Crumbliss of the City Commission, Knoxville, Tenn., has been authorized to ascertain costs and prepare plans for a second pump for the municipal water plant. It is proposed to install a 15,000,000 gal. per day pump, and it is estimated that the cost will exceed \$100,000.

D. C. Hodgson, Halston National Bank Building, Knoxville, Tenn., is in the market for a saddle-tank locomotive of 33-in. gage.

A cottonseed oilmill is to be erected in Alton Park, Chattanooga, Tenn., at a cost of \$200,000, by the Sulzberger & Sons Company, New York butterine manufacturers. C. W. Howard, director of the Chattanooga Chamber of Commerce, may be addressed.

The G. W. Stout & Sons Company, Owensboro, Ky., coöperation manufacturer, is considering equipping its hand coöperation plant with machinery. W. R. Stout is in charge.

Both the electric and ice plants of the Perryville Electric Lighting & Ice Company, Perryville, Ky., were destroyed by fire with an estimated loss of \$15,000. Russell Brothers recently purchased the property.

The property of the Frankfort Chair Company, Frankfort, Ky., was damaged by fire with a loss estimated at \$30,000.

Construction under supervision of Louis B. Herrington, Richmond, Ky., has begun on the hydroelectric plant on the Dix River, near Lancaster, Ky. The plant is estimated to cost upward of \$3,000,000 and will furnish power to various cities.

The Goodyear Tire & Rubber Company, Akron, Ohio, will erect additions to its mechanical goods and chemical plant at Nashville, Tenn., and is changing the course of the Little Cuyahoga River to provide the site.

A loss of \$75,000 was suffered by the Little River Lumber Company, Townsend, Tenn., by fire which destroyed its sawmill, powerhouse, ice factory, etc. W. B. Townsend is one of the principal owners and George B. Townsend, Knoxville, is a stockholder.

Two plants for the manufacture of cotton linters are projected by the Mississippi Hull Fiber Company, Memphis, Tenn., one at Memphis, with 25 bales daily capacity, and the other at Marianna, Ark. Joseph Newburger is president and J. H. McNeil is secretary-treasurer.

For the manufacture of a special type of farming implement patented by G. W. Wester of Harriman, Tenn., the Wester Hook & Hoe Company, Harriman, has been organized with W. C. Anderson, president; G. W. Wester, vice-president; J. A. Manley, secretary-treasurer, and George W. Chandler, general manager.

The Nashville Bridge Company, Nashville, Tenn., is in the market for 3-in. centrifugal pumps, gasoline engine driven, short drive or direct-connected.

H. M. Reed, John C. Vance, Charles Hardie, and others, have incorporated the Velvet Edge Iron Company, Chattanooga, Tenn., with \$5,000 capitalization.

The One Fire Asphalt Company, Chattanooga, Tenn., is in the market for a second-hand 25-hp. boiler in good condition.

Texas

AUSTIN, TEX., July 8, 1916.

The demand for irrigation pumping machinery and engine equipment is unusually good for this time of year. The small-tool trade is in satisfactory condition.

The Houston Car Wheel & Machine Company, founder and machinist, Houston, Tex., lost its brass foundry, which was destroyed by fire with a loss of about \$43,000. It was owned by the Kettler Brass Company and operated by the Car Wheel Company. It also lost its pattern shop at the same time with damage of about \$6,000. The latter will be repaired, but the brass foundry will remain idle for future development. J. H. Dore is manager.

Earl C. Cleaveland has completed a survey for a proposed hydroelectric plant that is to be constructed near Mogollon, N. M., to provide power for operating the machinery of mines in that district. About 1500 hp. will be generated.

It is reported that the United States war department plans to build automobile repair shops at Fort Bliss and at El Paso. Among the equipment needed will be 52 lathes.

The Farmers' & Merchants' Gin Company, Irene, will build a cotton gin at a cost of about \$8,000.

The Nacona Cotton-seed Oil Company, Nacona, will build a cotton-seed oil mill to cost about \$50,000. P. R. Brazleton is in charge.

The Dixie Oil & Refining Company, San Antonio, which has increased its capital stock from \$65,000 to \$100,000, will enlarge its oil refinery.

The Power Multi Machine Company, Silver City, N. M., which has a capital stock of \$300,000, will build a factory for manufacturing multiplying machines. Oscar Francke, San Antonio, is a stockholder.

An oil-burning engine will be installed at the municipal electric light plant at Hallettsville at a cost of \$7,000.

The Farmers & Ginners' Cotton Oil Company, which recently increased its capital stock from \$3,000 to \$100,000, will enlarge and improve its cotton-seed oil mill at Sulphur Springs.

The Southern Ice & Utilities Company, Dallas, which was recently incorporated with a capital stock of \$650,000, plans to construct and acquire public utility plants. C. W. Dawley, W. L. Martin and John L. Booty are stockholders.

St. Louis

ST. LOUIS, Mo., July 10, 1916.

Machine tool dealers find less difficulty in meeting demands for equipment. Business is keeping up at a high level and is in a much more satisfactory state than when deliveries were uncertain. Practically no equipment was bought in this section for war munitions purposes and little difficulty over resale tools is anticipated. While no large lists are appearing a steady call for single tools is noted for extension and replacement as well as new industries.

The National Art Bronze Works, St. Louis, Mo., has been incorporated with a capital stock of \$100,000 by Frederick C., John C., and Frederick B. Schmidt to equip a foundry at 4537 Pope Avenue.

The Safety Car Devices Company, St. Louis, Mo., has been incorporated with a capital stock of \$10,000 by Christopher P. Cass, Robert E. Adreon of the American Brake Company; John H. Trent, Arthur Digby and George E. Howard to manufacture safety devices.

The Santa Barbara Mining & Milling Company, St. Louis, Mo., has been incorporated with a capital stock of \$12,000 by G. E. and A. H. Donnewald, St. Louis, and H. J. Lynch, Joplin, Mo., and is in the market for pneumatic drilling equipment, power machinery, etc.

Wells, Fargo & Co., St. Louis, Mo., will erect and equip a garage at a cost of about \$50,000, including machine and repair shop equipment.

The P. & R. Mining Company, Webb City, Mo., has been incorporated with a capital stock of \$12,000 by P. R. Rackley, W. R. Smith, and others, and will buy mining machinery, pneumatic drills, power equipment, etc.

The Kansas City Sand Company, Kansas City, Mo., has been incorporated with a capital stock of \$60,000 by Charles Meirhofer, Godfrey Swenson and George H. Cope and will equip for sand recovery, including dredging machinery, etc.

Marshall, Mo., has voted \$70,000 for the equipment of a municipal electric light and power plant. Henrice, Kent & Lowry, Reserve Bank Building, Kansas City, Mo., are consulting engineers.

The St. Joseph Weeding Hoe Company, St. Joseph, Mo., has been incorporated with a capital stock of \$10,000 by Leroy Settle, John McClure, and others, and will equip a plant.

Chaffee, Mo., will receive bids until July 28 for an oil engine driven triplex pump and other waterworks equipment. Frank L. Wilcox, Syndicate Trust Building, St. Louis, Mo., is engineer.

The Farmers' Gin Company, Watson, Ark., has been incorporated with a capital stock of \$10,000 by S. W. Irby, F. A. Mewlin, J. R. Ferguson and E. M. Vaughn and is in the market for ginning machinery and power plant equipment.

The Texarkana Ice Company, Texarkana, Ark., has been reorganized by C. W. Dawley as president; C. M. Conway, vice-president; Stuart Wilson, secretary, and J. E. Ritchie,

treasurer, and will enlarge its plant for the manufacture of ice. The capital has been increased to \$150,000.

The Missouri Pacific Railway Company, St. Louis, Mo., E. A. Hadley, chief engineer, will equip a mechanically operated coaling station at Paragould, Ark.

The Aluminum Ore Company of America, East St. Louis, Ill., will equip a terminal at West Memphis, Ark., to include electrically operated mechanical loading apparatus, etc.

The Kern Drilling Company, Tulsa, Okla., has been incorporated with a capital stock of \$15,000 by T. J. Kern, T. and M. C. O'Keefe and will purchase portable power plant and drilling machinery.

The Cosden Oil & Gas Company, Tulsa, Okla., will increase its capital from \$5,000,000 to \$9,000,000 and issue \$6,000,000 of notes to add to equipment of its refineries, oil pumping stations, etc., for which plans are in preparation.

The Nabors Cooperage Company Corinth, Miss., is in the market for new equipment for the plant which it has acquired and is remodeling. A blower system is wanted.

The St. Louis & San Francisco Railroad Company, V. K. Hendricks, chief engineer, St. Louis, Mo., will equip a mechanically operated coaling station at Pottscamp, Miss.

Limestone crushing plants are to be equipped by Mississippi State penitentiary officials. E. J. O'Keefe, Parchman, Miss., is superintendent, and J. J. Coman, Jackson, Miss., secretary. About \$25,000 is available for machinery.

Felix Borden, Audubon Building, New Orleans, La., engineer for the Gretna Gas Light & Fuel Company, is in the market for gas manufacturing equipment. A plant to cost about \$40,000 will be installed.

Oakdale, La., will install about \$40,000 of waterworks equipment, including two 500-gal. per min. pumps, two 60-hp. oil engines, etc.

The Pacific Coast

SEATTLE, WASH., July 3, 1916.

The foreign commerce for Washington district during the month of May has set a new record, aggregating the enormous sum of \$40,022,415, thus outstripping every district on the Pacific seaboard. Seattle headed all the ports in the district with more than \$28,000,000 worth of goods handled in thirty-one days. In the matter of exports, Asiatic Russia through Vladivostok was by far the best customer, taking \$14,429,063 worth of goods. As usual, an excellent business was done with Alaska for the period.

Recent tests by leading railways of England have resulted in the placing of several large orders recently in the Pacific Northwest to supply fir for British railroad purposes. The British Admiralty has diverted vessels of large capacity to handle this business.

The Eccles Lumber Company's plant at Banks, Ore., was completely destroyed in a recent fire, with a loss of \$100,000. H. M. Eccles, president, states that the plant will probably be rebuilt. It had been operating only a few months.

The Montana & Utah Sugar Refining Company, which is building a sugar factory at Grants Pass, Ore., has announced that a beet-sugar factory will be constructed at Hamilton, Mont. The two installations will require the expenditure of \$500,000.

A fisheries building to cost \$25,000 is to be erected in Tacoma by the Glacier Fish Company. It will be 100 x 120 ft., and will be equipped with a cold-storage plant.

The Winslow Marine Railway & Shipbuilding Company, Seattle, newly organized with a capital stock of \$600,000, has taken over the pioneer shipbuilding plant of the Hall Brothers Marine Railway & Shipbuilding Company at Winslow, Wash., for \$300,000. The company will make improvements and will engage in wooden shipbuilding and ship repairing. C. C. Lacey, Seattle, will be manager.

The Washington Iron Works, Seattle, announces that improvements costing \$100,000 will be made to its plant. Work will include another furnace and other new equipment.

Following upon the taking over of the Seattle Construction & Dry Dock Company by the Todd Shipyards Corporation of New York comes the statement that the present capacity of the Seattle plant is to be doubled. A new steel floating drydock costing \$1,000,000 is to be built, and five new shipways are to be constructed. The company has recently secured contracts for two new steel freighters for foreign service.

The plant of the Raymond Foundry & Machine Company, Raymond, Wash., was damaged to the extent of \$18,000 in a recent fire. The blacksmith building, foundry and pattern room were completely destroyed; but the machine shop was saved. R. Gerber, manager, states that it will be replaced at once.

A corporation has been formed by D. A. Morrison, W. J. Price, W. S. Trueblood, L. L. Callaway and J. C. E. Barker, of Great Falls, Mont., to construct a cement plant in the vicinity of Great Falls, estimated to cost \$500,000. W. J. Price will be manager.

The Russell Beet Harvester Company has been incorporated at Provo, Utah, with John R. Stewart as president, to manufacture special machinery for sugar-beet cultivation.

It is reported at Salt Lake City, Utah, that the Utah Copper Company will make large additions to the Magna and Arthur mills.

The Hawaii Motor Supply Company, Ltd., has been incorporated at Honolulu, T. H., with a capital stock of \$100,000, with J. F. C. Hagens as president.

San Francisco

SAN FRANCISCO, CAL., July 3, 1916.

The waterfront strike is interfering with business and men are apprehensive of more serious labor troubles. The situation tends to retard buying. Despite these adverse influences most classes of machinery are moving better than usual for this time of year. Shops are working at more than their normal scale, and many are making important additions. Merchants and agents who can offer a fair assortment of tools for prompt or early delivery have little difficulty in making sales, while many buyers still take their time in hope of an easier market. In the miscellaneous machinery markets, oil-well and mining equipment, including gold dredges, are among the most important lines at present. Pumps and hydroelectric machinery are also quite active. The placing of new orders for wood-working machinery is for the time being generally suspended.

A T. Coe, formerly of Chino, Cal., has opened a new machine shop at Ontario, Cal., specializing on pump and engine work.

The Yuba Construction Company, Marysville, Cal., which specializes on gold dredge work, is starting work on an addition to its plant.

The General Roofing Mfg. Company, Richmond, Cal., is equipping the first unit of a plant.

The Monarch Engineering & Machinery Company, San Francisco, announces that it has perfected a new type of Chilean ore mill.

The National Ice Company has secured a site at Turlock, Cal., and plans to put in an ice-making outfit of 75 tons daily capacity.

The Mammoth Copper Company, Kennett, Cal., will build a plant for recovering zinc and other metals by an electrolytic process.

The Diamond Match Company has let contracts at San Pedro, Cal., for the construction of a towboat, barges and a kelp-harvesting outfit, with the object of manufacturing chemicals from kelp.

The Pacific Tank & Pipe Company, San Francisco, has about completed plans for a plant for the manufacture of wooden tanks, pipe, boxes, millwork, etc., at High Street and the Tidal Canal, Oakland.

Canada

TORONTO, July 10, 1916.

A further credit of \$25,000,000 for the purchase of war munitions and supplies in Canada is now available as a result of the conference between Thomas White, Minister of Finance, and the Canadian Bankers' Association. On account of their exceptionally strong position the banks have been able with ease to make their advances, which, as the money is spent, reverts to them in increased deposits. The transaction has been facilitated by the offer of the Minister of Finance to re-discount at any time the Imperial Treasury bills held as collateral for the advances. Available bank funds are so large that it is not probable that such re-discounting will be at all necessary; but the fact that these facilities have been provided has made possible the transaction on so large a scale. Re-discount facilities will again be adopted this fall in the financing of the Western crop movement. It worked most successfully last year.

It is reported that preliminary work in connection with the establishment of shipbuilding yards on Poplar Island in the Fraser River, B. C., has been commended by the Westminster Marine Railway Company, New Westminster, B. C., which has started to clear the site. The company proposes to build a plant on the island to cost \$70,000 and to install \$15,000 worth of machinery. Ways will be built capable of handling the largest coastwise vessels.

The Wabash Railroad proposes to build a repair shop at St. Thomas, Ont., and will commence work soon.

The Dominion Sugar Company of Wallaceburg, Ont., is building a sugar factory at Chatham, Ont., which will cost when completed over \$1,000,000 and will include eight buildings of brick, steel and concrete. The plant will be erected on a site of 64 acres. A machine shop will also be erected for making repairs to factory equipment; also a boiler-house, 50 x 175 ft., which will contain 12 boilers with a capacity of 4000 hp.

Price Brothers & Co., Ltd., Montreal, will add a new unit to its news print paper mill and will also make additions to other of its plants which will increase its production of sulphite and ground wood pulp to 55,000 tons of ground wood pulp a year and 25,000 tons of sulphite pulp. This undertaking will cost approximately \$500,000. A considerable amount of this expenditure will be for machinery and equipment.

The General Car & Machinery Works, Montreal, has rebuilt its plant, recently damaged by fire. The plant consists of steel, iron and brass foundries, forging and machine shops, with a total floor area of 117,000 sq. ft. A power plant has also been installed having a capacity of 1000 hp.

The Cameron & Genoa Company, Ltd., shipbuilders, Victoria, B. C., has received a contract from H. W. Brown & Co., Vancouver, B. C., for the construction of two auxiliary schooners. It is making extensive improvements to its plant.

The International Land & Lumber Company, Ltd., Ottawa, Ont., will shortly commence the erection of a pulp mill on the Ashuapmashan River to have a capacity of 100 tons per day. Elaborate plans are also being prepared for a model town site. J. L. Bates is president and R. N. Bates, vice-president.

Calgary, Alberta, proposes to install a sewage disposal plant at a cost of \$300,000. J. M. Miller is clerk.

Marcoux & Porier's foundry at Beauceville, Que., which was recently destroyed by fire with a loss of \$12,000, will be rebuilt and new machinery installed.

The Sick Children's Hospital has received a permit for the erection of a one-story brick and concrete powerhouse on Laplante Avenue, Toronto, to cost \$9,000. J. Ross Robertson is in charge.

The Canadian Pacific Railway Company will spend \$100,000 on improvements to its yards at St. John, N. B., including the erection of a coal-handling plant, a new water tank of 20,000 gal. capacity, etc. J. M. R. Fairbairn, Montreal, is assistant engineer.

Crotty & Elliott, Bothwell, Ont., are having plans prepared for an oil powerhouse to cost \$5,000.

Machinery will be required for the machine shop to be erected at Galt, Ont., for E. C. Roelofson. The plant will cost \$10,000. Plans for the building are being prepared by John Evans, 30 Water Street North, Galt.

The Du Pont Fabrikoid Company, 864 Dufferin Street, Toronto, proposes to build a factory at Toronto and is carrying on negotiations for a site of 11½ acres. W. A. Cotton is manager.

The Oliver Chilled Plow Works, Ltd., has received a permit for the erection of an addition to its plant on Burlington Street, Hamilton, Ont., to cost \$2,000.

The Motor Products Corporation, Walkerville, Ont., will build a factory. W. C. Rand, president of the Rand Mfg. Company, Detroit, Mich., is president of the Canadian company.

A contract has been awarded to the Thor Iron Works, Toronto, for the construction of a 261-ft. steel boat for the Great Lakes Transportation Company.

The Corbett Foundry & Machine Company, Ltd., Owen Sound, Ont., is in the market for a 2-in. bolt cutter.

The general contract for the rebuilding of the Northumberland Paper & Electric Company at Campbellford, Ont., has been awarded to T. McManus, of Campbellford. The plant will cost \$60,000.

The contract for the erection of an addition to the plant of the Victor Saw Works, Hamilton, Ont., has been let to H. C. Gummo, Tuckett Street, Hamilton, at a cost of \$6,000.

T. L. Church, chairman of the Board of Control, Toronto, is calling for tenders until July 18 for an overhead hand-operated traveling crane.

The Western Canada Marble & Tile Company will establish a plant at Winnipeg, Man., having taken over the premises of the Lewis Carriage Company, West Portage Avenue, Winnipeg. About \$20,000 worth of machinery will be installed in the building. W. B. Purtell is president and J. C. Purtell is secretary.

It is reported that the Federal Dyestuff & Chemical Corporation, 30 Pine Street, New York, with a plant located at Kingsport, Tenn., proposes to establish another in Western Ontario, in conjunction with some Toronto capitalists, for the

manufacture of dyestuffs, etc. Walter A. Guile, Jr., vice-president of the Federal Dye Corporation, is in charge.

The Canadian Allis-Chalmers, Ltd., Toronto, will build an addition to its plant to cost \$6,000.

The Alberta Foundry & Machine Company, Ltd., Medicine Hat, Alberta, will build an addition to its plant, 120 x 160 ft., to include an iron foundry and machine shop, and to cost \$20,000.

The Thor Iron Works, Toronto, Ont., is in the market for an electric traveling gantry crane, span about 57 ft., clearance 50 ft., overhanging at one end, load about 15 tons.

The Bowes Jamieson, Ltd., Hamilton, Ont., is in the market for Bertram waving attachment for 4.5-in. shells, with or without lathe; also 18 or 20-in. turret lathe.

The Leaside Munitions Company, Ltd., Toronto, has been incorporated with a capital stock of \$250,000, by William A. J. Case, 801 Dominion Bank Building; James B. Taylor, 78 Belhaven Road; Charles L. Valens, 516 Brunswick Avenue, and others, to manufacture time fuses, guns, shells, bombs, etc.

The Turner Wheel & Machine Company, Ltd., Windsor, Ont., has been incorporated with a capital stock of \$20,000 by Harry E. Guppy, William T. Turner, George F. Turner, and others, to manufacture automobile wire wheels, motors, accessories, etc.

The Remington UMC of Canada, Ltd., Windsor, Ont., has been incorporated with a capital stock of \$25,000 by John A. Worrell, 76 Adelaide Street West; William D. Gwynne, 27 Dunbar Road; John S. Smith, 47-a Pearson Avenue, and others, to manufacture firearms, ordnance, ammunition, weapons, military equipment and special machinery.

The Metals Coating Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of \$200,000 by Arthur R. W. Plimssoll, Reigner Brodeur of Montreal; Linton H. Ballantyne of Westmount, Que.; Jean V. Cartier of St. John, Que., and others.

Grant & Horne, St. John, N. B., contractors, are making rapid progress with the construction of the new machine works for T. McAvity & Sons, Ltd., on the Marsh Road. The plant will be ready for the manufacture of munitions and general machinery Aug. 1. It is the intention to concentrate all the firm's brass and steel plants in the city on the new site.

The Ruddock Cut Glass Company, Ltd., Toronto, has been incorporated with a capital stock of \$50,000 by David Henderson, 60 Victoria Street; William H. McGuire, 17 Hawthorne Avenue; George F. Rooney, 121 Carlton Street, and others.

Government Purchases

WASHINGTON, D. C., July 10, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until date not set, schedule 9870, three 500-kw. transformers for Norfolk; schedule 9872, for four turning gear motors and four fire-room hoist engines, all for Brooklyn; schedule 9874, for miscellaneous condenser, circulating and other pumps for Boston; schedule 9875, for two induction motors for Mare Island.

Women in German Locomotive Works

German manufacturers of locomotives are unable at present to fill orders, according to a review of the German locomotive industry, under war conditions, in *Die Lokomotive*. During the war year 1915 the Royal Prussian Railroads ordered 1502 locomotives, 26,000 freight cars, 2363 passenger cars, and 418 baggage cars, but on Oct. 1 205 locomotives and 5503 freight cars were still to be delivered, so great is the war pressure on the railroads. The *Railway Review* of Chicago, in giving an abstract of the German review, says that manufacturers are unable to fill such an order as the above in a year's time. For 1916 the Royal Prussian Railroads have ordered 1600 locomotives, 1700 passenger cars, 400 baggage cars and 38,000 freight cars. Every locomotive and car builder has received orders up to capacity, but operations are seriously curtailed because of a shortage of workmen. French and Belgian prisoners of war are working in many plants, under military supervision, many of them being skilled laborers from their own plants. Normally the German locomotive industry can produce 3,000 locomotives annually. Workmen called to war are, in many cases, replaced by women, 1600 being employed at present in the locomotive plant, Hanomag.

NEW TRADE PUBLICATIONS

Propeller Fans.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Folder. Treats of the uses of a propeller fan for ventilating engine and boiler rooms, workrooms and offices and for use in the home. Sketches showing some of the uses to which the fans may be put are included.

Sensitive Drilling Machines.—Johnson Machine Tool Company, Gouverneur, N. Y. Circular. Shows a 14-in. sensitive drilling machine of the belt-driven type. A brief description of the machine is given, together with a condensed table of specifications. One of the features is the use of a square table with a slotted apron that can be swung around the column or tipped at any angle and a round table having a vertical adjustment on the column and capable of being removed for the substitution of a cup or crotch center.

Friction Clutches and Hoists.—Brown Clutch Company, Sandusky, Ohio. Catalog C. Contains illustrations and brief descriptions of a line of friction clutches for use on line and short shafts and flywheels, and with couplings. Tables of the various sizes of each that can be supplied are included, together with diagrams showing the construction. Mention is made of a line of hoists and sprockets and chains that can also be furnished.

Soot Cleaners.—Vulcan Soot Cleaner Company, DuBois, Pa. Pamphlet. Size, 6 x 9 in.; pages, 91. Devoted to the application of soot cleaning apparatus to boilers, superheaters, economizers, garbage destructor boilers, waste heat boilers and similar apparatus. The questions of what soot really is, why clean heating surface pays and how soot cleaning can be accomplished are discussed in some detail, after which the design of the soot cleaners as applied to the various types of boilers and economizers is gone into at some length. Details of the construction of the cleaner are presented with particular reference to the design of the nozzles, anti-corrosion air relief valves and automatic tell-tale drain valves.

Concrete Roads.—Trussed Concrete Steel Company, Youngstown, Ohio. Pamphlet. Illustrates and describes the application of mesh for reinforcement, armor plates for joints, curb bars and edge protectors for concrete roads and pavements, culverts, sewers and bridge floors. Illustrations and descriptions of a number of roads built using the company's material are presented and a set of standard specifications for roads is included. A number of views of roads in course of construction are presented.

Pulleys.—American Pulley Company, 4200 Wissahickon Avenue, Philadelphia, Pa. Two booklets. The first, which is a reprint of a paper presented before the Engineers' Club of Philadelphia, points out the advantages of using pulleys equipped with cork inserts for the transmission of power. The results of a number of tests made on iron, wood and steel pulleys with and without cork inserts are presented and a number of diagrams showing the increase in power transmitted by pulleys having these inserts are included. The other booklet contains reports of tests that were made on belt pulleys for slip and the results secured are presented both in tabular and graphic form.

Autogenous Welding and Cutting.—General Welding & Equipment Company, 107 Massachusetts Avenue, Boston, Mass. Pamphlet. Points out the advantages of using the autogenous process for welding and cutting metal. General instructions for the use of the process are given and the text is supplemented by a number of engravings of different operations that have been performed and drawings of the torches and other apparatus employed.

Atomizer for Liquid Fuel.—H. B. Stilz, 1938 North Marvine Street, Philadelphia, Pa. Leaflet. Illustrations and descriptive matter explain the operation of an atomizer for use in connection with the burning of gas, liquid and powdered fuels. Among the points upon which special emphasis is laid is that the atomizer produces a flameless and non-oxidizing fire, the atomization taking place at the nozzle. The pressure on the oil is utilized directly to secure its atomization, the air from the blower being used merely to reduce the atomized film of oil to a fog and thus increase the efficiency of combustion.

Grab Bucket.—Pawling & Harnischfeger Company, Milwaukee, Wis. Folder. Mentions the advantage to be derived from the use of a single-line bucket as a solution of the labor problem in the foundry. Among the work which the bucket will do is the digging of pits, cleaning of floors, the unloading of cars of loose material and the distribution of it. An illustration of one of the buckets in use and a partial list of users with the number of buckets installed in each case are included.

